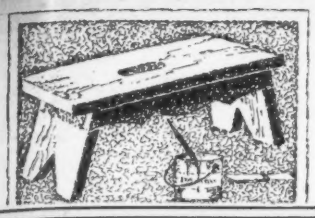
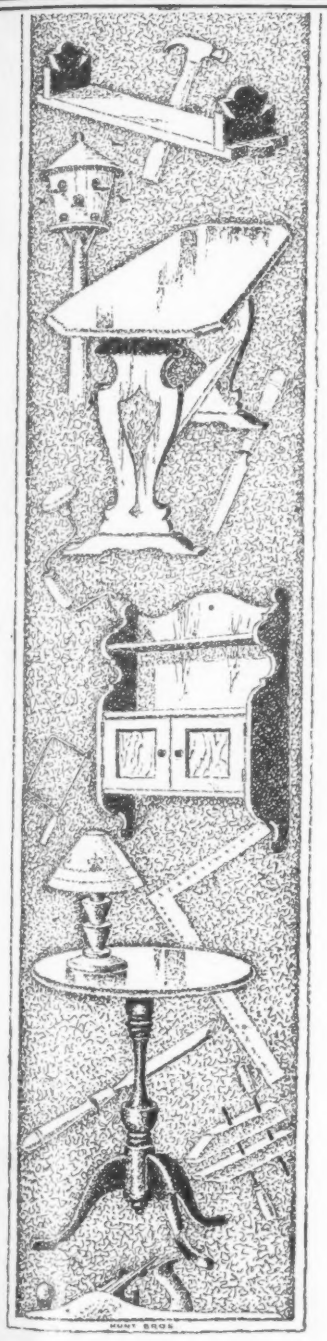
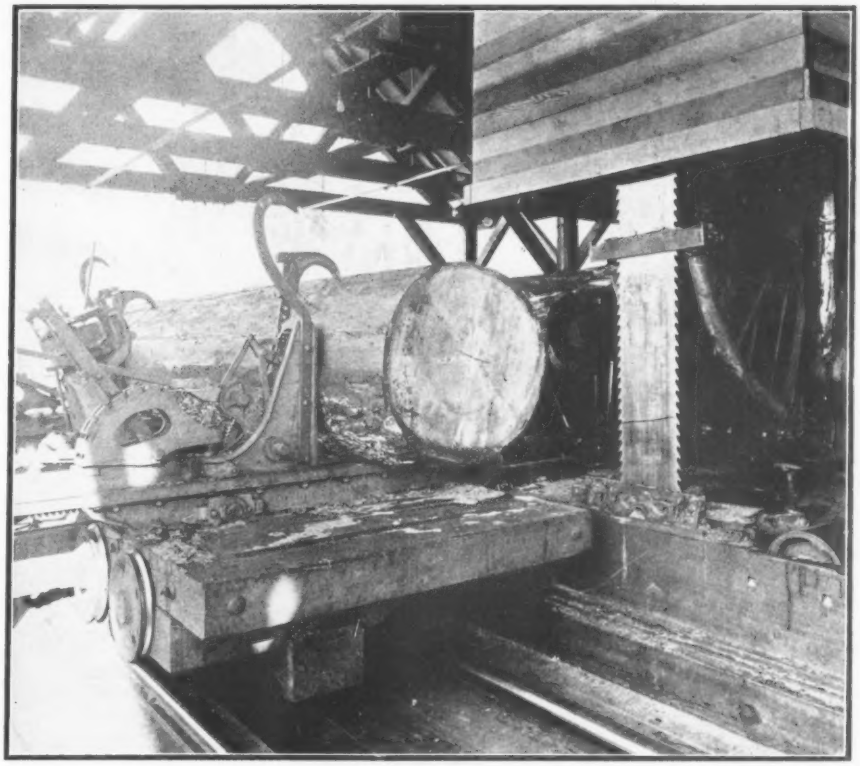


JULY 1934

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION





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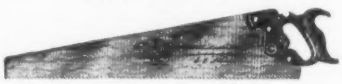

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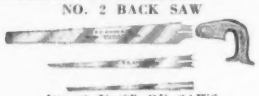

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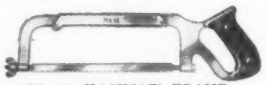

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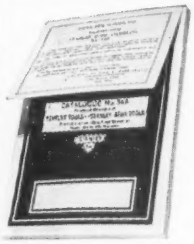

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION
July, 1934
Vol. 23, No. 7

Industrial Arts Must Lead

Harry S. Ganders

Dean of Teachers College, Syracuse University, Syracuse, New York

A restatement of the responsibility and opportunity confronting the leaders in the fields of industrial arts and vocational education. Whether or not the reader agrees to all of the suggestions made by the author, matters little. The big thing is, are the industrial-arts leaders big enough to do the job which the writer suggests?

AN OPPORTUNITY for revitalizing American education, through the industrial arts, is a definite possibility. For its realization, however, teachers in the industrial-arts field must cease thinking of their work as elements separate and apart from the rest of education.

The present trend toward unity results in part from the "project" method, early applied in the field of the industrial arts. This innovation is causing the artificial wall between cultural and vocational education to crumble. It is challenging traditional education, proving it in many respects fundamentally wrong.

Fortunately, an increasing number of educators are beginning to realize that interests in industry are excellent centers around which education can be achieved. Many are convinced that education is as life is, a unity. In progressive schools throughout the country, "projects" are no longer used as sideshows or special exhibits, but that a succession of "projects" or "activities" are entirely displacing the old subject-compartmentalized curriculums. The "generalists" are learning that life interests of individual children, rather than subjects, constitute the roots through which education feeds. All should see, that such interests are the focal points around which cultural as well as industrial and vocational knowledge can be acquired.

Industrial-arts teachers should not be content in merely training in skills and processes. Instead, they should capitalize the opportunity for making the industrial arts the core in and through which innumerable cultural elements of civilization can be taught. Through their fields, they might furnish leadership to the whole of education. This is a bold concept, but to each courageous and far-seeing industrial-arts teacher, the present trend toward unification of education presents no less a challenge.

To rise to this opportunity, it is imperative that allegiance to industry be minimized. In vocational schools especially, but also in industrial-arts shops, so much is heard about industrial processes and so little about *education* that it seems appropriate to raise the question, if perchance, industrial-arts shops are primarily industrial plants and only secondarily educational institutions. It is one thing to coöperate with industry, but quite another to light educational lamps at its altars.

Many benefits accrued to industrial-arts education because of its close association with industry. The work has become more practical. Immediate needs of children are brought to the attention of schoolmen and diversification of programs follows. It is no accident that certain aims here are fairly clear, whereas there is an absence of clearly stated objectives in much academic education. The definiteness and specificity which characterizes some of the work in industrial-arts education is in no small measure attributable to the influence of industry.

There are other dangers also, to be avoided. Is it unfair to charge that industrial-arts instructors have followed industry in placing the emphasis upon production and products? Have they not given too little consideration to the development and growth of individuals? In these classes, one sees and hears much of the product — the thing. Is it possible that these teachers, as industry itself, are interested in products, and that they leave to "related" or "academic" departments the major education of individuals?

Vocational schools are even worse offenders. Like industry they tend to take too short a view of the interests and needs of children. Schools should be interested in immediate efficiencies, but as is so tragically evident from rapid shifts in industry, the school must be even more concerned with what type of man the boy will be. What will young men and women wish to do, and what will they be able to do

when suddenly thrown out of employment? Permanent quotas of unemployed emphasize the importance of education for life versus training.

The high degree of specialization of function in a plant prohibits individuals learning even of industry! Therefore, the school must differ from the occupation, if but to permit the worker a bare understanding and appreciation of the process of which he is himself a part. Even though a job is of vital importance, a job is not the whole of life. Vocational teachers have always recognized this latter fact, but the fatal mistake inheres in copying industry's unhappy solution of divorcing vocations from living. This can be and is largely accomplished in factories, but is incompatible with real education. Perhaps some history, literature, language, mathematics and science can be memorized separately for repetition at a later date. But the use of the "project" method and "unit" organization demonstrates that the so-called cultural subjects can best be taught in connection with a life interest. Industry is primarily interested in production — education in the development of individuals and society. Therefore it is the part of wisdom to remember the extremely narrow limits within which industry can be used as a reliable guide to education.

If unity can be achieved and educational rather than industrial standards set up, there are valid reasons for looking upon industrial arts as a fertile field for the development of significant educational leadership. One reason is that academic education will be slow to furnish leadership for a major reorganization. Academicians are too much committed to a policy of dissection, which gradually and effectively kills real education. They, like some educators, have not yet seen that only when there is unity, coherence, and free interplay of elements, can there be a living education. That the disassociated, compartmentalized subjects of academic schools are dead, is all too obvious even to academic teachers themselves. There is probably sufficient dead wood in the academic tree to warrant the ever-present strenuous resistance to a "shaking-up." It should be more profitable to seek leadership for a reconstructed and revitalized education from among men and women in the industrial-arts fields. The latter can meet the challenge if they become students of the whole of education and if they can but envision the possibilities in their full comprehensiveness.

Another reason for regarding the industrial arts as a source from which leadership may arise is their "democratic character." America being essentially democratic in its political and social organization, these schools, whose contributions are so obviously for the well-being of the 90 per cent, are sure to gain in popular support.

Educational leadership should emerge from among the industrial-arts group because, with the exception of an attempted divorcement of vocational and cultural education, their basic educational assumptions are sound. Schools and departments of industrial arts do not have children carry on meaningless, formal exercises in disassociated and unrelated artificial subjects. The pupil's experiences, his problems, and his projects are, as they should be, the center of this education.

A group with a sound theory which comprehends the essential unity of educational experience, and concerns itself with the development of all the people's children constitutes an acceptable foundation for the evolution of virile, educational leadership.

The attainment of this high purpose depends upon the avoidance of certain dangers. First among the latter is a tendency to pay less attention to the individual pupil. The appearance in the industrial arts, of "job" or "instruction" sheets, devised to handle larger numbers per class, should be heeded as a warning that methods of *mass* instruction are beginning to be introduced into this field. This fatal error of academic education should be avoided. Leaders in these latter areas concluded that because the children of the masses came to school, pupils should be herded together in droves, given a number, and knowledge and wisdom could be piped down from a single reservoir [the teacher] to the many pupils below. The only reason 40 and 45 pupils are found in academic classes is because educators said it was feasible. The practical arts were started right — with small numbers in each class, providing for daily growth of individuals. The future of this important education justifies an aggressive campaign against educators as well as against laymen who would recapitulate in the industrial arts, this serious mistake of academicians.

Leaders in this field should not be hurried, by the presence of numbers, into setting up patterns which, in spite of their best efforts, will become crystallized by tradition and which, if wrong, will forever plague them. The essence of democracy is socialized individualism, and sooner or later the people will overthrow any and all institutions which fail to contribute maximally to the evolution of the individual.

Narrowness must also be avoided. The economic and social life of today indicates that the school should recognize the limitations of training and fully appreciate and emphasize contrasting education. Specifically, the student should be helped to see generalizations. To be able to do a thing is not to be compared with the comprehension of principles involved which have varied and broad applications. The former is training, the latter education.

Principles in the fields of practical education have been sacrificed for specificity because the latter is more definite and gets immediate results; also because in our academic schooling, principles have been hazy, incomprehensible, and disassociated from life. This does not refute the fact that if arrived at inductively, i.e., out of the experiences of children, broad principles are among the most valuable of all elements in education.

Narrowness is indicated in the failure to incorporate

into the industrial-arts program, cultural elements inherent in these courses. Teachers of vocational education, and even industrial arts, have been so possessed of the idea of segregating industrial and "cultural" educations, that not only have they turned over to other departments the so-called cultural courses, but they have been so afraid of "culture" that they have almost entirely omitted the wealth of history, literature, and art inherent in the very vocations they are trying to teach.

Experience in cabinetmaking, forging, and sheet metal in a number of secondary schools of the country has demonstrated the utter barrenness of the training received. What does the pupil learn of the wood, glues, stains, and varnishes, iron, copper and brass, which go into the making of chairs, andirons, and torchiers? The entire emphasis is restricted to *making things*. There is no time for education — only for training. Should there not be time, in schools, for education — for the formulation of generalizations, for the thorough understanding of fundamental processes, for history of industries, for the story of the evolution of processes from primitive forms? Should there not be opportunity for reading the rich and thrilling literature of commerce — by mule teams on the dusty plains, of sailing ships, and transatlantic steamers, and of tremendous efforts to harness the forces of nature to do man's bidding? Should there not be time for the literature of trades and industries — literature which recites the painful and slow development, not of things, but of man and the slow evolution through the centuries of his ideas?

And is there no place for a consideration of social values which are after all the reason for industries? Is there no time for an appreciation of social, economic, and political organization involved in present-day industrial life? No place for the art, not necessarily the art of sunsets, but of the toil and work of man?

Note that the topic under consideration is not the *related subjects*, but the culture inherent in the course itself. The grave necessity for leisure education need not be evoked to show wherein education has been derelict. Unwittingly, we have followed industry to a de-vocationalizing of vocations.

Continued failure to include as integral parts of industrial education, the essential elements of a broad vocational culture, the neglect of generalizations, and subservience to mass instruction, may forever obscure the light of the new day and cause this group to fail in its opportunity.

Industrial-arts education faces a challenge to lead, because its basic "project" theory provides a firm foundation for all education and because it points the way to educational unity. It should avoid a too close adherence to industrial patterns and must never be justly charged with lack of vision and narrowness.

High-School Shop Teachers

Harry E. Bolle

Deerfield Shields High School,
Highland Park, Illinois

A study of the status of vocational and industrial-arts teachers in the high schools of the State of Illinois.

THE purpose of this study was to ascertain certain qualifications and activities of industrial-arts teachers in Illinois. Permission was received from Thomas Diamond, associate professor of vocational education, University of Michigan, to use a questionnaire which he developed in a study of Michigan industrial-arts teachers in 1927. The data for this study were collected in the spring of 1931.

Eight hundred and twelve questionnaires were sent to teachers. Of these, 496, or 61.1 per cent, were returned. If a supervisor taught four or more periods a day, his report was included in the study.

TABLE I
Classifying the Data

	Groups	Classification
Vocational Group		Smith-Hughes teachers
Ind. Arts	Group I	All cities 3,000 pop. or less
	Group II	Cities between 3,000 and 10,000 pop.
	Group III	Cities between 10,000 and 50,000 pop.
	Group IV	Cities between 50,000 and 150,000 pop.
	Group V	All cities over 150,000 population

In grouping the data, it seemed advisable to assemble facts secured from the teachers in cities of 3,000 population or less in one group. Under the township-high-school plan, which exists in Illinois, several cities make up a high-school district. It is plain that under this system, some small cities will show a comparatively large enrollment in their high schools. Tables I and II give the size of the groups, number of cities, as well as the number of teachers reporting in each group.

Table III gives the ages of the teachers in the various groups. The median age for Group I is 29.2 years; Group II, 31; Group III, 34; Group IV, 38.1; and Group V, 38.7. The Vocational Group median is 36.8 years, between the median

TABLE II
Number of Cities and the Number of Teachers from Each Classified in the Various Groups

Group		Includes	No. of Teachers
Vocational Group		16 cities	48 teachers
Ind. Arts	Group I	95 cities	98 teachers
	Group II	54 cities	70 teachers
	Group III	38 cities	79 teachers
	Group IV	7 cities	37 teachers
	Group V	1 city	144 teachers

age of Group III and Group IV. The median age of the entire group is 34 years; 25 per cent of the teachers are 29 or younger, and 25 per cent are 41.1 or above in chronological age.

Table III shows that, as the size of the city progresses, the median age also increases. It is likely that the young teacher begins his work in the smaller cities, and moves to a larger one as his experience increases. Nine teachers in Group I, however, were 46 years old or above. Since, in nearly every

case, these men do not have much professional training, it probably was difficult for them to secure positions in larger cities and hence they remained in the smaller cities.

TABLE III

Age Distribution for Teachers in Each Group

Ages in Years	Voc. Group	Group I	Group II	Group III	Group IV	Group V	All Groups
67 - 69						2	2
64 - 66						1	1
61 - 63		1		2			3
58 - 60	1	1				2	4
55 - 57		1				2	3
52 - 54	1	1			2	3	7
49 - 51	2	3	2	3	2	11	23
46 - 48		2	3	3	5	12	25
43 - 45	9		1	4	5	6	25
40 - 42	5		2	6	2	21	36
37 - 39	5	4	3	9	4	19	44
34 - 36	8	11	10	11	4	15	59
31 - 33	9	13	14	12	2	22	72
28 - 30	4	20	12	16	5	9	66
25 - 27	2	29	17	9	4	8	69
22 - 24	1	12	6	1	2	3	25
Total	47	98	70	76	37	136	464
Median	36.8	29.2	31.	34.	38.1	38.7	34.
First Quartile	32.6	26.3	27.	29.7	30.	32.9	29.
Third Quartile	43.4	33.9	35.1	39.6	45.9	45.6	41.1

In Smith's[1] study of 110 Minnesota industrial-arts teachers in 1923, eight are reported who had completed four years of college work, none had earned graduate degrees, and eight had attended industrial schools of noncollege rank. Seventy-three had completed two years of college, while three had completed three years of college work. Diamond[2] found in 1927, that of 384 Michigan teachers, 28.8 per cent held degrees. Seven-tenths per cent had completed graduate work and 10.7 per cent had not taken work after graduating from high school.

The scholastic attainment of the various groups of Illinois industrial-arts teachers is given in Table IV. Of the 47 teachers in the Vocational Group, ten (21.3 per cent) have master's degrees. Thirty (63.8 per cent) of the teachers have degrees, while nine (19.2 per cent) have completed two or more years of college work, but do not have a degree. In Group I, slightly over 80 per cent have degrees. Since Group I consists of many teachers who have taught but a short time, it seems that it is, at present, almost necessary to have a degree in order to secure a position in the field of industrial arts.

In considering all the groups as a whole, we find 289 (60.9 per cent) of the teachers have degrees, and of that number 28 (5.9 per cent) have master's degrees, while only 13 (2.7 per cent) have taken no work beyond the high school. The number of teachers with degrees is indeed large when compared with the number a few years ago.

Table V shows that 418 teachers gave the name of the school from which they were graduated, or the school from which they received the greater part of their preparation for teaching. Fifty-two American and two foreign schools were listed.

The University of Illinois leads in the preparation of industrial-arts teachers for Illinois: 56 (13.4 per cent) teachers studied at the University of Illinois; 41 teachers (9.8 per cent) at Bradley Institute; 32 (7.7 per cent) at Armour; 31 (7.4 per cent) at the Stout Institute. Normal University places more men than does any of the other state normal schools of Illinois. It is interesting to note that the state normal schools place most of their graduates in the smaller cities, namely those in Groups I, II, and III.

TABLE IV

The Number and Percentage of Teachers in Each Group Distributed According to Their Scholastic Attainment

Grade Completed or Degree	Voc.Group		Group I		Group II		Group III		Group IV		Group V		All Groups	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
M.A.	6	12.8	1	1.	2	2.8	4	5.1			2	1.4	15	3.2
M.S.	1	2.1			1	1.3	4	5.1			3	2.1	9	1.9
M.E.	3	6.4									1	.7	4	.8
B.S.	16	34.	44	45.4	39	54.9	28	35.4	20	54.1	32	22.2	179	37.7
B.A.	3	6.4	18	18.6	5	7.	5	6.3	4	10.8	8	5.6	43	9.2
E.E. or C.E.	1	2.1					1	1.3					2	.4
B.Ph. or B.Ed.			13	13.4			1	1.3	1	2.7	12	8.3	27	5.7
B.E.			2	2.1	2	2.8	4	5.1	1	2.7	1	.7	10	2.1
3 years' College	7	15.	10	10.3	12	16.9	16	20.3	5	13.5	27	18.8	77	16.2
2 years' College	2	4.2	8	8.2	7	9.9	7	8.9	3	8.1	37	25.7	64	13.5
Less than 2 yrs.College	6	12.8			2	2.8	6	7.6	2	5.4	16	11.1	32	6.7
Completed High School	1	2.1					2	2.5			2	1.4	5	1.1
2 years' High School					1	1.3							1	.2
8th Grade			1	1.							2	1.4	3	.6
8th Grade and Trade School	1	2.1					1	1.3	1	2.7	1	.7	4	.8
Totals	47	....	97	....	71	....	79	....	37	....	144	....	475	....

TABLE V

Schools from Which Teachers in the Various Groups Received Degrees or the Greater Part of Their Preparation for Teaching

Institution	Voc.Group		Group I		Group II		Group III		Group IV		Group V		All Groups	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
University of Illinois	1	2.1	21	26.9	10	16.1	16	22.2	1	3.3	7	5.5	56	13.4
Bradley Institute	8	16.7	8	10.3	6	9.7	9	12.5	8	26.7	2	1.6	41	9.8
Armour Institute	2	4.2	1	1.3			2	2.8			27	21.1	32	7.7
Stout Institute	6	12.5	2	2.6	5	8.1	11	15.3	5	16.7	2	1.6	31	7.4
Normal University	1	2.1	15	19.2	5	8.1	5	6.9	1	3.3			27	6.5
University of Chicago	1	2.1	1	1.3	1	1.6			1	3.3	21	16.5	25	6.
Chicago Normal											19	14.8	19	4.5
Lewis Institute	2	4.2									17	13.3	19	4.5
Indiana State Normal	3	6.3	2	2.6	8	12.9	2	2.8			2	1.6	17	4.1
Millikin U. Decatur	2	4.2	7	9.	5	8.1	1	1.4	1	3.3			16	4.1
State Normal, Charleston			5	6.4	3	4.8	4	5.6	2	6.7	1	.8	15	3.6
West. Ill. S.T.C., McComb			8	10.3	2	3.2	5	6.9					15	3.6
North.Ill. S.T.C., DeKalb	2	4.2	1	1.3	6	9.7	1	1.4			1	.8	11	2.6
Purdue University	4	8.3	1	1.3	2	3.2	2	2.8	1	3.3			10	2.4
De Paul University	1	2.1									5	3.9	6	1.4
C.M.S.T.C., Missouri			1	1.3	1	1.6			3	10.			5	1.2
Northwestern University											4	3.1	4	1.
Loyola University	1	2.1									3	2.3	4	1.
Kalamazoo T. College							1	1.4	2	6.7	1	.8	4	1.
Oshkosh Normal, Wisconsin			1	1.3			2	2.8	1	3.3			4	1.
Platteville S.T.C., Wis.			1	1.3	1	1.6	2	2.8					4	1.
Others	14	29.2	2	2.6	7	11.3	9	125	4	13.3	16	12.5	52	12.4
Totals	48	....	78	....	62	....	72	....	30	....	128	....	418	....

[1]Smith, Homer J., "Industrial Education in the Public Schools of Minnesota," *Educational Monograph No. 6*, College of Education, University of Minnesota, 1924.

[2]Diamond, Thomas, "A Study of the Teachers of Industrial Arts and Industrial Education in the State of Michigan," *Special Studies No. 3*, School of Education, University of Michigan, 1927.

The number of years of teaching experience for the various groups is given in Table VI. In the Vocational Group all of the teachers had at least two years' teaching experience. This is true also of Groups IV and V. This again leads us to believe that the beginning teacher must start in the small community and gain some experience before he can expect to teach in the larger systems.

TABLE VI

The Number of Years' Teaching Experience for Each Group

Teaching Experience --Years	Voc. Group	Group I	Group II	Group III	Group IV	Group V	All Groups
30 or more		4		1		7	12
29					1	2	3
28		1			1	2	4
27	2					1	3
26		1				1	2
25		1			1	1	3
24	2		1		1	1	5
23			1	1		5	7
22	1			1	1	1	4
21					2	2	4
20			1	3	2	6	12
19	1			4	1	4	10
18	1		2	3	1	12	19
17	1	1	1		1	3	7
16	1		2	2	1	3	9
15	3	2	2	2	2	5	16
14	1		1	5	2	5	14
13	5	1	1	6	2	5	20
12	3	4	2	2	2	11	24
11	6		3	5		12	26
10	3	4	7	6	2	18	40
9	3	5	6	3	2	2	21
8	3	3	3	3	1	6	19
7	3	12	5	7	2	5	34
6	2	9	7	3	1	6	28
5	1	5	6	8	1	7	28
4		7	2	2	4	2	17
3	3	13	8	4	3	3	34
2	2	16	5	3	1	5	32
1		6	5	1			12
Total	47	95	71	75	38	143	469
Median	11.6	6.5	7.5	10.6	13.	12.5	10.2
First Quartile	8.3	3.1	4.	6.3	6.5	9.9	5.8
Third Quartile	15.8	8.95	10.9	14.7	19.5	18.8	15.2

The median teaching experience in years for Group I is 6.5 years, and in each succeeding group as the size of the city increases in population, the number of years of teaching experience also increases. The median for all the groups, including the Vocational Group, is 10.2 years. Twelve teachers in all the groups have taught thirty or more years.

Of 474 replies, 152 (32.1 per cent) of the teachers have held but one teaching position. In Groups I, II, and III, the number who have held one position is greater than the number occupying a second position. In the Vocational Group, and in Groups IV and V, the mode is those holding their second position. Three hundred and seventy-seven teachers (79.5 per cent) had held three positions or less.

Table VII shows how much trade experience the various teachers had.

Of 432 replies to the question concerning trade or industrial experience, 94 teachers (21.8 per cent) had experienced no connection with industrial work other than teaching industrial-arts subjects. The median for the entire group of 338 teachers, who had worked at a trade or in an industrial plant, was 4.5 years.

The vocational teachers have the longest week, 28.2 hours of teaching. There is little difference between Groups I and II, but rather a marked difference occurs between Groups I and II, when compared respectively to Group III. In each succeeding group the hours taught increase, and the median for all teachers is 25.5 hours per week.

TABLE VII

Years of Trade Experience for Teachers in the Six Groups

No. Years' Trade Experience	Voc. Group	Group I	Group II	Group III	Group IV	Group V	All Groups
25 or more	1					2	3
24							
23							
22						1	1
21						1	1
20		1		1	2		4
19						1	1
18	1			1		2	4
17	1						1
16						3	3
15	1			1		4	6
14						3	3
13		1				4	5
12	4				1	4	9
11	1					3	4
10	1	1	1	2		10	15
9	3				1	4	7
8	3	1	3	1	1	5	14
7	1	1	1	2	1	4	10
6	8	4	5	3	2	11	33
5	4	5	4	6		10	29
4	3	9	4	4	2	9	31
3	1	11	8	12	2	13	47
2 years or less	4	14	10	11	6	9	54
1 year or less	2	15	10	9	6	11	53
No Experience	2	31	23	16	6	12	94
Total	38	83	46	83	24	114	338
Median	6.6	3.2	3.4	3.8	3.	6.5	4.6
First Quartile	4.8	2.5	2.2	3.4	2.	3.7	2.6
Third Quartile	10.5	4.8	5.6	5.6	7.	11.	7.7

The writer has recently interviewed many teachers in Groups IV and V. Some of the schools, in addition to increasing the number of pupils per class, have also increased the teaching load by adding an additional period per day to re-

TABLE VIII

The Number of Classes in the Various Groups Distributed According to the Number of Pupils in Each Class

Number of Pupils	Voc. Group		Group I		Group II		Group III		Group IV		Group V		All Groups	
	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small
46 or more											3		3	
45									1		3		4	
44														
43											3		3	
42							1				2		3	
41											5		5	
40					1						7	1	8	1
39					2						5	7		
38					1						10	2	11	2
37					1						7	1	8	1
36							2	1	1		5	1	8	2
35	2		1		2		1		1		11	1	18	1
34			1		1		2	2			3	5	7	7
33	2		1		2		2		1		5	7	13	7
32	3		1				6	2	2		3	5	15	7
31	2		3		1		1		1		8	3	16	3
30	7	2	5		4		9	2	2	1	17	7	44	12
29	1		3		1		3	2	1		10	4	19	6
28	2	3	1		4		8		2		12	12	29	15
27	3	2	2		1		4		4		7	3	21	5
26	2		5		6		2	1	5		8	8	27	9
25	2	5	3		4	4	4	2	4	1	4	23	21	35
24	2	2	6	2	5	1	8	2	6	3		18	27	28
23	1	3	4		2	2	3	1			1	9	11	15
22	2	1	6		6	3	6	4		6	1	8	21	22
21	1	1	2	1	3	3	4	1	1	4		5	11	15
20	5	2	4		8	3	3	11	3	3	1	6	24	25
19	2	1	1	2	2	5	1	1	1	1		3	7	13
18	1	1	5		3	6	2	9	1	5		4	12	25
17	1	4	6		1	5	2			3		1	10	13
16			7	4	2	1	2	9		2		1	11	17
15	3	5	7	2	4	4	1	6		3		1	15	21
14	1	1	2	7	1	4	1	6		2		2	5	22
13		1	6	3			1	3			1	1	8	8
12		2	4	13		6		7		1		1	4	30
11			1	9		2		1					1	12
10		2	3	5		6		3					3	16
9				6	1	2		1		1			1	10
8		5		10		3		1						19
7		1		8		1				1				11
6 or less		1	1	19		7		1					1	28
Total Replies	45	45	91	91	68	68	79	79	37	37	143	143	465	465
Median	26.8	18.5	21.3	10.5	24.2	15.8	26.8	18.2	26.5	19.5	32.5	25.5	27.5	19.4
First Quartile	20.7	13.3	15.8	7.5	20.4	10.7	22.5	14.5	24.5	16.6	29.8	23.3	22.1	12.7
Third Quartile	30.7	25.2	26.5	12.9	28.8	19.8	30.5	21.5	29.8	22.3	38.4	29.3	31.9	24.9

duce industrial-arts budgets. This may account for the longer week in cities of larger population.

The number of classes in the various groups distributed according to the number of pupils in each class is given in Table VIII. The median number of pupils in the large classes in Group I is 21.3 pupils and the small classes is 10.5 pupils. The median number of pupils in the small classes in Group V exceeds the median of the large classes for Groups I and II.

In Group V, we find one class of 59 pupils, one of 55, and another with 48 pupils. The large class in both the Vocational and Group I is 35 pupils; in Group II, 40 pupils; Group III, 42; and in Group IV, there is one class of 45 pupils. There is a tendency for the number of pupils in the class to increase as the city becomes larger. It is certain that some teachers have far too many pupils in some of their classes, to teach them efficiently.

Frank E. Hardin,[3] head of manual-training department, Manual Training High School, Peoria, Illinois, in a study of the "Teaching Load of the Shop Teacher," finds many schools equipping shops to care for 36 pupils in a class. In conclusion he states: "Whether or not the work is to be successful under the new conditions that seem to be coming, will depend on three things: (1) type of work to be presented; (2) type of boy to whom work is presented; and (3) ability of the teacher to systematize, organize, and present the work."

In the past, industrial-arts classes had fewer students than did the academic classes, but it is quite evident that the size of the shop classes will be much larger in the future, in order to lower per capita cost of industrial-arts subjects. The trend toward increase in enrollment is clearly evident.

(To be continued)

[3]Hardin, Frank E., "The Teaching Load of the Shop Teachers," *Industrial Education Magazine*, pp. 183–186, December 1930.

A Study of Mechanical Ability

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The test described here was given to a class of opportunity-school students, of the slow and incorrigible type. The ages of the students tested varied between 14 years 2 months, and 17 years.

THIS study is concerned with one phase of vocational guidance for those boys who, for reason of incorrigibility, slowness, or both, have been excluded from regular school classes. It attempts to apply measuring tools to the problem of predicting the probability of success in work of a mechanical nature, as a basis for determining school training.

The boys tested were from the oldest class in the Columbus Opportunity School. Permission to give the tests was given through the courtesy of the principal of the school. Chronologically, the ages range from 14 years 2 months, to 17 years, with a mean age of 15 years 8 months. Most of the boys were Negro, and were reported by the principal as being from very low-grade homes.

As used here, mechanical ability may be defined as:

> The ability to succeed in work of a mechanical nature; or putting the matter in more concrete terms, mechanical ability is that which enables a person to work with tools and machinery and the materials of the physical world, and in doing so, to perform creditably or to turn out an acceptable product.[1]

Since capacity is inferred from measured ability, it is assumed that a measure of the mechanical ability of these boys would, with fair accuracy, suggest the probability of success in occupations demanding mechanical ability, as a class. Mechanical ability is probably of a complex nature that is not easily analyzed. However, at least two aspects of such ability may be accepted: the ability to succeed in the actual manipulation of the tools, and the ability to secure information about tools, materials, and their uses. In a negative sense, the distinct lack of ability in either or both of these aspects would rather definitely restrict the choice of occupations requiring such ability.

In this study the first of these aspects is measured by the Minnesota extension of the Stenquist Assembly Test, and the Minnesota Paper Form Board Test, Form B. These two, when weighted and combined, give a correlation with the criterion of quality of mechanical work of .62, which compares favorably with college prognosis tests of academic ability. The second aspect of mechanical ability was measured by the Otis Self-Administering Test of Intelligence, Intermediate Examination, Form A. The Otis Test was found, in the Minnesota study, to correlate .71 with the information criterion.

The mechanical-aptitude tests have not been applied to workers in mechanical occupations, so no direct comparison can be made with these. The results given here are based on the assumption that the criterion of the tests represents fairly, the type of mechanical ability demanded by mechanical occupations. It is recognized that there is probably a large amount of overlapping in the degree of mechanical ability demanded by jobs of widely different rank, just as the Army Alpha Test showed to be the case with general intelligence.

Common administrative practice segregates and provides special training for children of the type investigated in this study. Classwork consists of a mixed program of academic and handwork of various sorts. This handwork may be of several types. Probably, in many instances, it is used because it provides something that, if simple enough, this type of child can do with objective success. Gesell states that,

> Nothing will make the deficient child so happy as vocational work; nothing will better train and discipline him.[2]

He defines vocational work, by example, as spool knitting, rug weaving, basketry, coping-saw work and similar occupations.

While there seems to be little agreement among educators as to the kinds of work or the aims of training for these children, they seem to include a large share of handwork of one kind or another. Goddard argues for repetitive work that will make the backward child socially useful:

> The whole question of the defective child going to work is one which at first sight seems to have many difficulties. . . . It is rarely that he can be employed in the regular way at all. He is unable to earn enough to make him a profitable employee. The importance of the point raised is that in many instances these children are no longer getting anything profitable in school; and in some cases they can do work at home for their fathers and mothers who have some little business of their own where they can employ the child. In a few cases, some other employer may, for one reason or another, be induced to take these children on and give them a little something in the way of wages to contribute to the family support, but most of all, it gives the child pleasant employment and makes him happy. . . . It is quite possible that we may find in the course of our attempts at industrial training, that these children can be trained to certain kinds of piece work: some-

[1]Donald G. Patterson, *et al.*, *Minnesota Mechanical Ability Tests* (Minneapolis: University of Minnesota Press, 1930), p. 6.

[2]Arnold Gesell, *The Retarded Child: How to Help Him* (Bloomington: The Public School Publishing Co., 1925), p. 73.

thing that is simple and uniform and does not require a great amount of judgment or intelligence. Such things should be tried out and the children trained along these lines.[3]

At some variance to this is the suggestion that,

The hand must become a "thinking hand." . . . Systematic, well-planned handwork should enable the moron or dull-normal, by the time he finishes the grammar school, to use his hands with certainty, precision, and the least possible loss of motion. . . . It cannot be done by developing skill in doing one particular detail of work and keeping the child at work on that indefinitely.[4]

The assembly test was given in two sittings in one morning. Response indicated a high degree of interest, and good attention was maintained throughout the test. Two weeks later, the Otis S.A. Test was given, followed by the Paper Form Board Test. Results on the Otis Test were not satisfactory or convincing as to reliability. All but two boys worked diligently during the time interval, but the results shown in the table, indicate either an exceptionally low level of intelligence, as measured by this test, or the need of a different type of test for these pupils, or both. It is probable that a test having a relatively small amount of reading required, and short units of several types, such as may be found in the lower ranges of the Kuhlman-Anderson tests, would have given more reliable results. As a result of the unreliable findings of this test, it was not combined with the other two into one measure as was planned. Response on the Paper Form Board Test was apparently satisfactory for securing the maximum possible response, consistent with ability. The results would indicate that the test is probably too difficult for these boys.

In the table, scores are given for each boy in each of the tests. The mean of the Assembly Test is 188.4, with a range of 81–245, and an S.D. of 42.5. The mean of the Paper Form Board Test is 12.4, the range 2–26, and the S.D. 7.45. Scores on these two tests are combined according to the formula:[5]

$$C' = \frac{1 \cdot X_1}{\sigma_1} + \frac{.8486 \cdot X_2}{\sigma_2}$$

in which C' is the criterion, X_1 the Assembly Test, and X_2 the Paper Form Board Test. Each score is divided by the S.D. of the distribution of which it is a part, and combined for each boy's final score. The mean of the combined scores is 5.85, and the S.D. 1.62.

Scores on the Paper Form Board Test are so low when compared to age norms for each boy that 11 of the percentile ranks are zero, and the others in the third and fourth percentiles. Greater variability and a higher ranking are indicated by the Assembly Test scores, in which the percentiles range from 0–35. The extent of the factor of race as an influencing variable is unknown.

High in manipulative ability. Low in information	High in both abilities
Low in both abilities	High in information. Low in manipulation.

If a fourfold table is constructed with the Otis Test results, representing the information criterion, and the combined mechanical-ability tests, representing the manipulative criterion, it will be found that all of these scores fall in the quarter indicating below-average ability in both.

Conclusions: Adequate vocational advice cannot be given until other traits are known, and "dead line" scores in the abilities tested here have been established for various jobs. However, a negative conclusion of some importance is evident. As measured by the tests given, it is reasonably certain that these boys must eventually find employment in those lines of work requiring a low degree of manipulative skill and low information, generally classed as unskilled labor.

The relative mechanical ability of the boys may be estimated from the added scores from the Assembly and Paper Form Board tests.

TABLE OF SCORES, AGES, AND PERCENTILES

Boy	Years C.A.	Months Otis M.A.	Otis I.Q.	Assembly Test X_1	$\frac{X_1}{\sigma_1}$	Form Board X_2	$\frac{.8486 \cdot X_2}{\sigma_2}$	Sum	Assembly Test Percentile	Form Board Percentile
A	14-2	8-9	68	160	3.76	6	.68	4.44	0	3
B	15-3	8-2	56	245	5.77	7	.80	6.57	0	35
C	14-6	8-4	60	152	3.57	11	1.25	4.82	0	2
D	16-7	8-7	56	189	4.45	6	.68	5.13	0	6
E	14-11	11-6	82	226	5.32	22	2.51	7.83	3	30
F	15-8	12-10	89	169	3.98	4	.46	4.44	0	3
G	15-9	7-8	50	226	5.32	7	.80	6.12	0	16
H	16-4	no data		241	5.68	25	2.48	8.52	3	23
I	14-4	no data		166	3.91	15	1.71	5.62	3	3
J	17-0	7-10	49	172	4.05	7	.80	4.85	0	2
K	15-10	10-10	74	213	5.02	26	2.96	7.98	4	10
L	16-5	8-11	58	230	5.42	20	2.28	7.70	3	18
M	16-5	14-4	96	155	3.65	9	1.03	4.68	0	3
N	15-5	7-9	52	193	4.54	8	.91	5.45	0	9
P	14-11	11-6	82	151	3.56	18	2.05	5.61	0	3
Q	16-3	8-2	53	82	1.91	2	.23	2.14	0	0
R	15-7	11-10	82	235	5.54	18	2.05	7.59	3	22
Mean	15-8	9-10	67.1	188.4		12.4		5.85		
S.D.			15.2	42.5		7.45		1.62		
High	17-0	14-4	96	245		26		8.52		
Low	14.2	7.9	49	81		2		2.14		

The illustrations show work done for the needy of the Hartford Tuberculosis Society by the students of manual-arts work, Hartford, Conn. Submitted by Walter F. McAndrews, Supervisor of Manual-Arts Work.

[3] Henry Goddard, *School Training of Defective Children* (New York: The World Book Co.), p. 67.

[4] Annie Dolman Inskeep, *Teaching Dull and Retarded Children* (New York: The Macmillian Co.), p. 342.

[5] Reference 1.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION
J. J. Metz, Editor

The Machine and Industrial Art

There are many people who seem to have an unfounded prejudice against anything produced mechanically. To them the machine is the root of all evil. Nothing produced by the machine is of any good. In their opinion, machine-made products lack strength and beauty, and besides all this, they rob the craftsman of his God-given right to produce the products of his own planning by the skill of his own hands, and by the sweat of his own brow.

Recently an exhibition of machine art, arranged by Mr. Philip Johnson of the Museum of Modern Art, was held in New York City. The purpose of the display was to show what the machine had accomplished in the way of producing artistic products for the home, the school, the office, the shop, the farm, or for the embellishment of buildings of every type. This exhibit showed that the machine can produce things of exquisite beauty and grace in many mediums and for many purposes. It also showed that the machine is capable of doing many things that the craftsman of old could hardly hope to accomplish. Above all, the exhibit showed — probably indirectly, but nevertheless conclusively — that because of the machine, God's favorite, the common man, may now enjoy the use and the possession of many articles of convenience, pleasure, and even luxury that the man of influence and wealth of a hundred years ago could not have afforded had they existed and been made by the laborious hand processes of his day.

"Yes, but look at the craftsmen the machine has displaced," many will retort. No doubt that is true. The machine in taking the drudgery out of the life of the old-time craftsman also has reduced the time required by the craftsman in accomplishing his task. Had the machine not done this, its value to mankind would not have been very great. It is only because the machine can produce many articles in the same time that it formerly took to make one, that it enables more men to enjoy things which would otherwise be too scarce or too costly.

"But how about the craftsmanship that has been lost?" Probably it would be better to use the word *artificer* rather than *craftsman* when one speaks of the skilled, artistic workmen of the past. It is true they have disappeared, and their successors may not possess the skills and arts which were practiced by those old masters whose work we admire and preserve in present-day museums. But are there no artificers today? Did it not take skill, ingenuity, and artistry to produce the machines that now perform the work previously accomplished by the laborious methods of the masters of old? Does the fact that these machines reproduce hundreds of parts of an old masterpiece with an accuracy which the old artisans strove for but could not achieve, militate against the machine? Is the old masterpiece more worth while just because it is handmade — though less accurate? Is the machine-made reproduction less valuable because man's ingenuity has made it more perfect than the piece from which it is copied? Does the machine-carved molding lose in value because each addition of the motif is exactly like its predecessor? Every good hand carver of moldings tries to accomplish that but usually does not succeed. Does the machine entirely replace the artificer who uses hand tools only, or is it not a fact that practically all new designs, carvings, and the like, must be first worked up, more or less by hand, before the proper profiles, master patterns, templates, and forms can be made which are needed in machine production?

It must not be forgotten that the machine is just what man makes it. It is incapable of doing anything by its own volition. It is only as perfect as it is made. It is capable only of doing that for which it has been designed. It is neither honest nor dishonest although the man who designed it, its owners, or its operators may be. Of itself it has no control over the truth and honesty of its products, being entirely dependent upon the human master, whether it may work for the good or for the detriment of humanity.

It is well for industrial-arts and vocational educators to get the right attitude on the machine. It is through them that the students — the future workers of America — must get theirs if some of the erroneous ideas about the machine age are to be corrected. It is to be hoped that man will never again retrogress to the point where he will not have machines to help him accomplish his work and gain some of his pleasures.

It is so easy under present conditions to blame conditions on the machine rather than on the heartlessness, dishonesty, and avarice of man. It is the teacher who must first clearly see the contribution of the machine to humanity, and then influence the student — the future American worker, agriculturalist, business man, banker, industrialist — to use the machine for his own and for humanity's benefit and satisfaction.

Planning The Safety Program

With the summer vacation ahead, many shop teachers are contemplating the revision of their outlines of instruction for the coming school year. While undertaking this troublesome though necessary piece of labor, the shop teachers should not overlook the fact that last year's safety work also should be carefully checked over to disclose any possible shortcomings.

Industry is placing greater and greater emphasis upon the safety consciousness of the worker; hence, viewing this subject only from the demand side, it would seem necessary that the shop teacher take it into account as an important item in his outline of instruction. Naturally, for the earnest teacher, the employment value of safety comes as a secondary consideration. He feels that he has a moral responsibility to keep

his student from harm. For such a teacher, therefore, the improvement of safety instruction is doubly important.

Then, too, the method of teaching safety should be carefully considered. The earliest attempts were made by the teacher lecturing to the entire class. Frequently this was done in an academic room when the students and teacher were removed from shop conditions and surroundings. This method was quite abstract; yet abstract as it might have been, it was better than no instruction at all.

Later on, some instructors tried to make safety instruction a matter of job or information sheets, with test questions to see whether the student had absorbed the important facts.

Still others made safety a part of the shop instruction, and added demonstrations to their lectures and quizzes. Other teachers blessed with classes that had been much enlarged, felt themselves incapable of close enough supervision, and so some have added student safety councils and student safety engineers to their own efforts to inculcate safety habits into their students.

The individual teacher, of course, must decide just how he wants to put the safety idea across in his shop. It is well to do that now when the time for calm deliberations is at hand. It may also be well, while the question of safety for the school shop is being contemplated, to bear in mind that the student should be trained in the proper use of first-aid materials and of first-aid practices. For this reason, the outline of instruction also should contain the important phases of this study.

Consumer Knowledge

The progressive present-day industrial-arts teacher will not fail to make one of the objectives of his course stress consumer knowledge and appreciation. It seems self-evident that the student not only should learn to make a few projects but also should acquire a basis for forming proper judgments on the method of construction used in the things which he buys. He should know something about the materials used, so that he can compare similar articles made by competing manufacturers; he should be capable of comparing different types of finishes — in other words, he should be able to make an intelligent choice. With this ability, and it is conceded that it can be transmitted in the school shop if the course is properly given, there ought to be still another factor instilled in the student as a by-product of the industrial-arts course, and that is an appreciation of the value which the maker of the object under consideration has put into it.

Man is so constituted that what he possesses or what he has done usually has a greater value than that which his neighbor has made or has in his possession. The industrial-arts student ought to learn, however, that the other man's labor has just as much value as his own. For that reason every buyer ought not only to know how to judge the consumer values but he ought also be in a position to make a just estimate of the value of the article because of the fact that it was made of a certain material and finished in a certain way.

It is customary for every man to hold out for the highest wages for his own work and then expect others to do their work for less. It is also common for one to estimate that he could do a given job in much shorter time than another can do it. In other words, man is apt to overestimate his own power and capacity when comparing himself with others. This is detrimental to the just and sane appraisal of the other man's work.

The teacher in the school shop can do much to instill into his students the habit of applying the golden rule — do unto others as you would have others do unto you. It will be an additional point to stress but really in an honest civilization there ought not to be a need for the buyer to deprecate the goods he purchases in order to beat down the price, nor ought it to be necessary for the seller to mark up his goods in order to have some margin for deductions which might have to be made at the time of sale.

If the school is trying to teach consumer values, the teacher must not forget also to teach attitudes which will insure the recognition of the other man's rights as well as the appreciation of his work.

Informing The Public

The Schoolmart and Schoolview which will be held in New York on August 15 to 24, inclusive, is an attempt to give the right kind of publicity to educational methods. It is a concerted movement fostered by educational as well as industrial leaders, and will be both an exposition and an examination of modern trends in public-school education so that the American public may become acquainted with what science and industry have done to make the school of tomorrow better in every way.

Whether this particular effort will be successful in meeting the objectives set for it by its originators is difficult to say, but it is to be hoped that the public will be aroused to a realization of the fact that the depression has caused many of the young to be deprived of opportunities to such an extent that the evil consequences thereof may be of much greater magnitude than even the most pessimistic are imagining.

Evidently the American public has forgotten the old saying, "As ye sow, so also shall ye reap," and in the name of economy have reduced educational facilities without seemingly considering the future of those going through the schools at the present time. They have ignored the fact that an untrained or poorly trained population cannot be depended upon to build up an enlightened civilization.

Whether or not the Schoolmart and Schoolview will be successful in arousing public opinion against this foolhardy gamble in futures, with the children of today as the pawns, is questionable, but if it arouses only a small part of America to an earnest study of educational trends, it will have contributed something for which the schools and future America must be thankful.

Wood Carving—VI

J. I. Sowers

Director of Industrial Arts,
Miami, Florida

The sixth in a series of articles describing the art of wood carving as adapted to industrial-arts work.

IT IS said that when Lillian Russell, in a burst of enthusiastic interest, asked Rodin how best to learn the art of sculpturing, he replied, "Just get a block of marble and knock off what you don't want." A very simple formula, the acceptance of which depends upon the artist's skill and ability in being able to decide what he doesn't want, and his skill in eliminating it from his conception of the finished piece. And in this lies all the difference between the plastic art of a native Polynesian and the best examples of fifteenth-century Gothic carving.

Carving in wood is doubtless older than painting. The efforts of primitive people to express themselves by sculpture, in mud, stone, wood, and other materials requires far less ability and knowledge than do attempts to set down these same ideas on a plane surface by means of line drawing, color, and shading.

The untutored folk of the early ages of man's development found it easier to duplicate real things in shape and form with greater truth to detail in sculpturing than by drawing. The latter method of representation requires methods of abstract thought and some notion of symbolizing and conventionalizing ideas before it can be applied.

Carving, then, may be said to be not only the oldest, but also the most *natural* of the arts. It blossomed and came to a degree of fruition earlier than the other arts. Upon these facts, doubtlessly, is based the native ability that many persons have for modeling forms, shapes, and ideas in plastic materials. It is certainly a fact that it is easier for a larger number of persons to express themselves creditably by graphic representation in plastic mediums than by pictorial representation on a flat surface. The decline of wood carving in modern decorative schemes is undoubtedly due to the fact that it does not readily yield itself to commercial machine production at small cost. The best wood carving still requires the individual touch of the creative artist. As men have more and more leisure at their command we may confidently expect to see a revival of the arts, and among these it will doubtlessly be true that the old and fine art of carving in wood will see a new renaissance among amateur craftsmen whose avocational interests run along the line of fine construction in wood.

Carving Modeled in Relief

This article continues the description of the same style of carving described in the May number of this magazine. It will be noted that in these articles the discussion of carving in wood has been from the standpoint of different types of execution, and not from the basis of different types of design, or the different nationalities or historic periods in which it was produced. This latter forms an interesting and exhaustive study, but would be of little practical value to the beginning worker.

Figure 29 shows several simple developments of conventionalized forms of the acanthus leaf. The use of the acanthus leaf perhaps came into preëminence as a motif in both wood carving and sculpture because of its use as the characteristic decoration of the capital in the Corinthian column, the richest and most ornamental type of Grecian architecture. There are several forms of this leaf, any of which will be readily recognized by the *eyes* which are prominent in them all. With the mastery of this form, the student of wood carving enters into the rich field of classic modeling. This motif has a wide application to use in many forms, some of which are suggested in Figure 30. No. 4, for instance, shows a rather easily executed form used on the leg and stretcher of a table. Other forms are shown in Nos. 6 and 7.

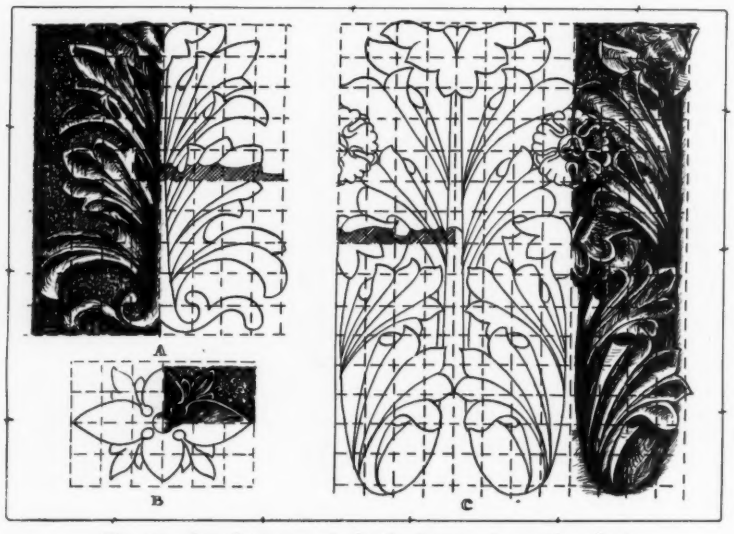


Fig. 29. Development of simple forms of acanthus leaf.

Trace the pattern on the wood, using carbon paper, and shade in the detail. It will be better, of course, if you are a beginner, to work this model up first in plastic clay, or work out a part of the leaf on a cake of soap,

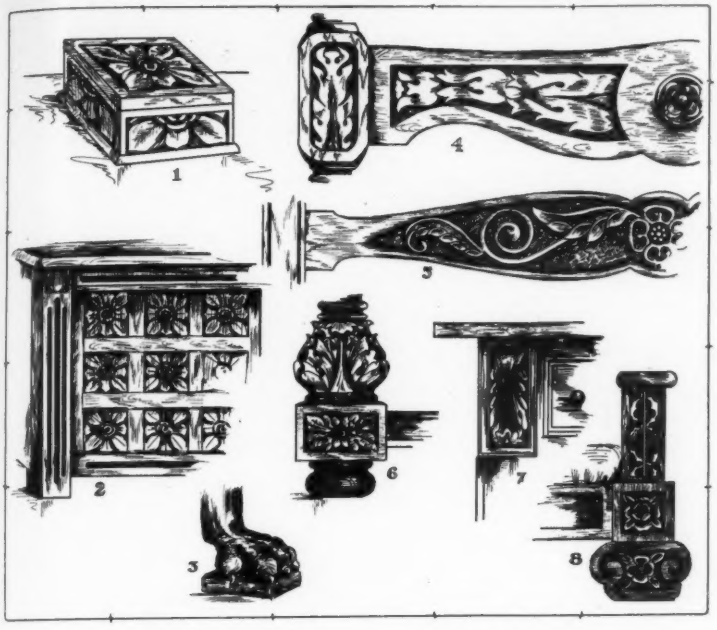


Fig. 30. Some applications of modeled relief carving.

before undertaking to work in wood. The value in doing this is that it gives a knowledge and feeling of what the student is trying to accomplish, and enables him to see his work clearly in three dimensions. There are many fine examples of acanthus-leaf carvings to be found, and much valuable information may be gained by studying them. After having acquired a general understanding of the pattern and layout of the acanthus, the student should practice cutting it in practice pieces of wood until he has a fair command of it before attempting it on a finished piece.

Figure 30 also shows some applications of the design shown in Figure 21 in the May number. The small box, No. 1, Figure 30, shows this design used on the top, and half of it on the sides. No. 2 is a wall chest, made entirely of panels with this same design. As a matter of fact, it may be well to have all students carve Figure 21 on stock 8 in. square as an exercise piece. The best of these exercise pieces may then be used to construct the wall chest shown.

In working on the acanthus leaf, the student soon learns to use the *sweep cut*. In this cut the gouge moves forward by the pressure of one hand, and is drawn into a sweeping, or sheer cut, by the guiding or control hand, being either drawn toward, or pushed away from the operator as it moves forward. The mastery of this cut is essential to good carving, but skill in its use is more often acquired by earnest effort in execution, rather than by deliberate practice.

It will be noted that the leaves and lobes of the

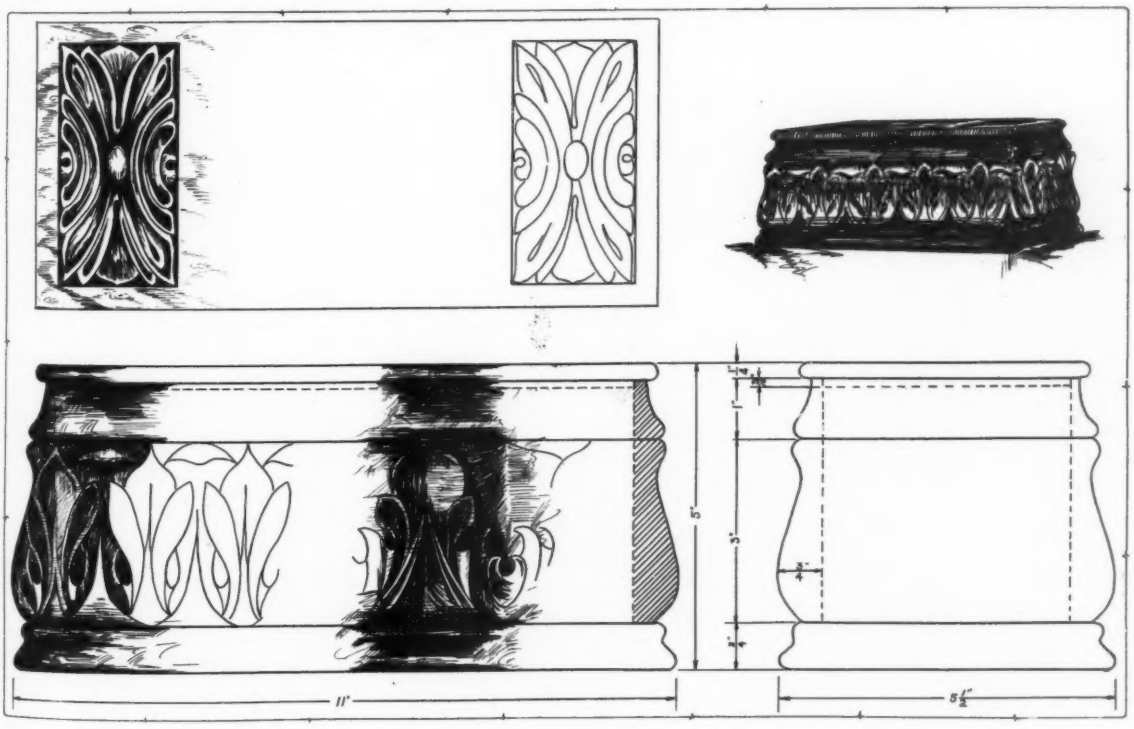


Fig. 31. A jewel casket.

acanthus leaf are hollowed out slightly. It is well to select a gouge for this work having the curve of the leaf.

Figure 31 shows a jewel casket with curved sides

Fig. 32. Arabesque design after the manner of Raphael.

upon which two different types of acanthus leaves are shown. It is, of course, supposed that the student will choose the type of conventionalized leaf that best suits him. The adaptation of the leaf to the curved surface should not prove difficult. In making this box, all four sides are made together in one piece. Select a piece about 1 by 4 by 33 in., and shape it up as a molding. Then lay out the design, and carve on the lower part of this piece. The box is put together with a miter cut at corners, the top and bottom assembled, and the work completed before the top is sawed off the box proper. In order to take care of this saw cut, and the necessary sanding, the molding used for the sides should be made slightly wider than 4 in. The case is then ready for the hinging and finishing. After work done in relief carving is stained, it is important to highlight the raised parts slightly with No. 2/0 steel wool. This removes a part of the stain on the high parts, thus giving the effect of contrast in color. The casket, when well made, is a beautiful piece, and is worthy of the time put upon it.

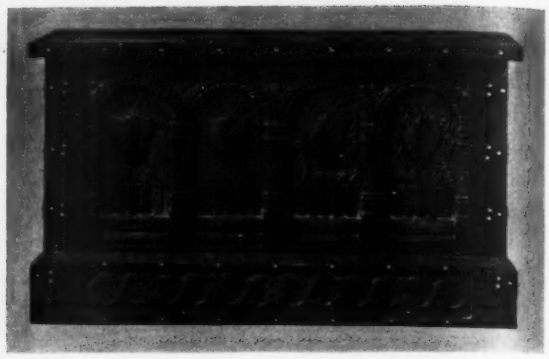


Fig. 34. A Gothic chest, 15th century design.

Figure 32 is an arabesque design after the manner of Raphael. This style was developed toward the end of the fifteenth century. The particular piece of work from which this photograph was taken was made by a seventeen-year-old schoolboy of Bristol, England, in a class in wood carving. The design itself is the work of his instructor. It will be noted that the high relief in which this piece was worked, throws a shadow which serves to bring out the work.

Fig. 33. An Italian Renaissance type table.

Figure 33 is an Italian type table made and carved by a high-school student as a class project. It is simple and classic in its lines.

Figure 34 is a Gothic chest. It is a fifteenth-century design, and is carved in oak and is equipped with wrought-iron fittings. It is a popular project in an advanced wood-carving class, and a number of high-school students have made this chest in varying sizes. Most of the work on it is done in rather high relief, but some of the backgrounds are in low relief.

Problems and Projects

DESK DRAWER

W. Ben Hunt, Hales Corners, Wisconsin

(See Supplement No. 294)

A small dresser or chest of drawers can easily be converted into a desk by the changing of one drawer. The drawing shows how this may be accomplished. In most cases the front board of the drawer is all that can be used because this board naturally matches up with the rest of the dresser. In order to make a real job of it, the rest of the desk drawer should be of the same kind of wood as the dresser itself. Five-ply veneering, ½ or ⅝ in. thick, will solve the problem of the sides, back, and bottom if solid wood is not available. The cubby-holes, etc., should be thinner, ⅛ or ¼ in.

As most drawers are dovetailed, the front board should be cut away as shown at A, and a crosspiece glued securely into this space. The bottom of the front should be rabbeted as shown at B. If the bottom board is of the same thickness as the front, it must be rabbeted also, to fit.

There are numerous ways of holding up the front board of the desk. The support shown at the lower left is made of brass. The simplest way is shown at the lower right. There are regular desk-lid supports on the market which are made for just such desks, should you wish to buy them. If a clean piece of carpeting or rug be placed on the workbench or across the horses when working on this desk, the entire dresser need not be refinished. A little care to keep the front from being scratched will save a lot of time later on. The new parts naturally should be finished to match up as nearly as possible to the old.

SIMPLE SHEET-METAL FOLDER

Ira C. Madden, Detroit, Michigan

The sheet-metal folder shown herewith has been in use in my shop for five years and has proved very useful. It cannot, of course, be compared to a real bar folder, but will do the work very well in shops which cannot afford the better equipment.

The folder shown is made of metal, but other instructors have made theirs of hard wood and have lined it with thin sheets of metal. These have proved equally successful. The folder may be fastened to a bench with screws.

After the sheet metal to be bent has been clamped between the two jaws of the folder, a mallet must be used to make the bend.

ATTRACTIVE CANDLE SHADES WHICH ARE EASILY MADE

D. Elizabeth Roberts, Philadelphia, Pennsylvania

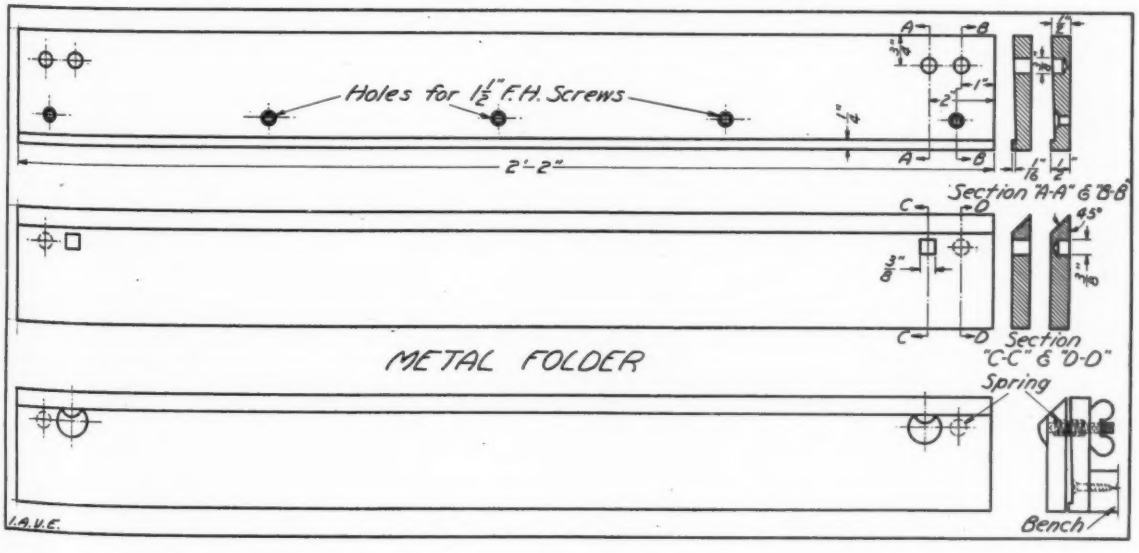
Candle shades are quite easy to make and require but little material. One design can often be worked out in several ways, giving quite different effects. Light-weight cardboard or heavy paper, either white or tinted, or crêpe paper may be used, and often a combination of different materials gives a good effect.

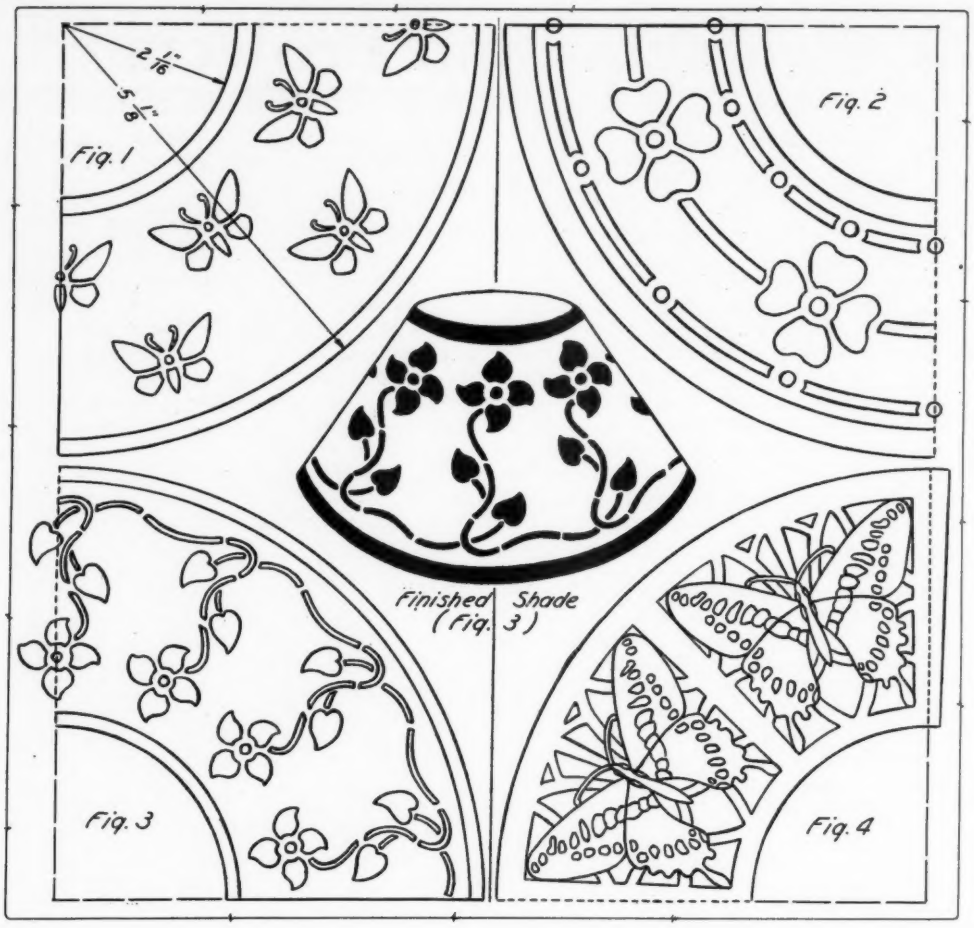
All the shades illustrated are the right size to fit an ordinary shade holder. To make such a shade, draw from the same center one semicircle 4⅛ in. diameter, and another 10¼ in. diameter (see dimensions in Fig. 1). It is necessary only to make a layout for half of the shade, the other half being repeated from the dotted line. Allow about ¼ in. extra at one side to overlap where the sides are pasted together. A shade this size or a little larger could be used over an electric bulb, if made over a wire frame.

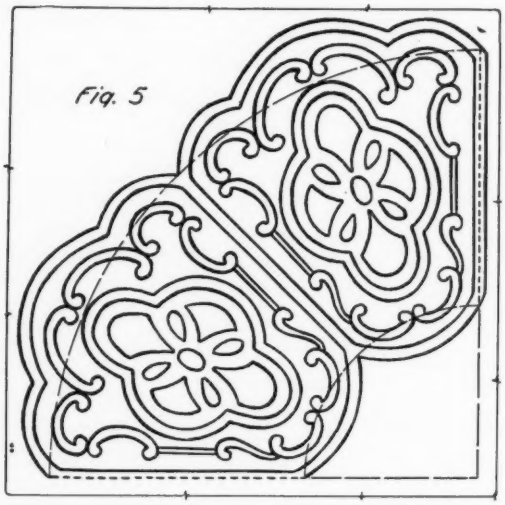
The shade shown in Figure 1 may be made of heavy paper, such as water-color paper or mat stock. The little butterflies may then be stenciled on with water or oil colors. If preferred, they may be painted, after the outline has been done in India ink. One tone of some bright color may be used, or the wings and body of the butterfly may be painted with different colors. The bands should be of some darker color which harmonizes with the colors used.

Figure 2 shows a design stenciled in oil or water colors on light-colored stock. The conventional flowers may be pink, orange, or some other preferred color, and the connecting bands green or brown or some color mixed with gold water color. The dots may be done in gold. The bands at the top and bottom of the shade should be of a darker tone to harmonize with the other colors.

The shades just described could be made more elaborate by making them on crêpe paper and fastening them to a framework of cardboard at the top and bottom. The design should be either stenciled or painted on crêpe paper of some light color, using the same colors as described before. An outline of gold around all the parts of the design gives a good effect. To







make the framework, cut two cardboard bands about 3/8 in. wide, the size of the large and small semicircles. Mark the size of the shade on the crêpe paper, and paste the cardboard bands at the top and bottom of the paper, on the wrong side. Then paste a strip of gold or any fancy paper at the top and bottom of the shade to cover the cardboard bands. Paste the sides of the shade together, being careful not to stretch the crêpe paper. It is well to paste a piece of heavy paper along each side of the shade, before overlapping the sides. This keeps the crêpe paper from stretching. The shade should be lined with plain crêpe paper or, if possible, fireproof crêpe paper. In lining the shade, be careful not to stretch the paper at the edges, but the lining should be made to fit as tightly as possible.

The shade in Figure 3 may be made on heavy paper or mat stock, with the design stenciled in water or oil colors. The conventional flowers may be given any desirable color, and the leaves a light green, with the stems either dark green or brown. The bands at the top and bottom of the shade could be green or brown. A shade with the whole design and borders done in black or one tone of a color would be very effective. Instead of using a stencil, the design could easily be traced on the paper and colored with or without an outline.

The shade in Figure 4 is made of a light-colored mat stock or heavy paper, with gayly colored butterflies. The outlining should be done with India ink before the design is colored. The butterflies should be tinted any bright color — yellow, blue, etc. — or with a color mixed with gold. The spots on the butterflies may be left the color of the paper. The spaces around the butterflies should be outlined and then colored some darker tone, or they may be cut and a lining of crêpe paper pasted underneath. For this shade, the entire width of the band at the side should overlap the other side.

The shade in Figure 5 may be made of mat stock or water-color paper. The design should be outlined in India ink and then painted in oil or water colors. A good color scheme for a cream-colored background would be rose and yellow for the conventional design in the center, tan or light brown for the

form around this design, tones of green for the scrolls and tan or brown for the border around the shade. Instead of being painted, the stencil design in the center may be cut out and a lining of crêpe paper used, as described for the shade shown in Figure 4. This shade has the same dimensions as the other shades, but the extra curves are added at the top and bottom. In this shade also, the width of the band at the side should be as wide as the band on the other side.

FOOTSTOOLS

C. A. Van Kammen, Grand Rapids, Michigan

Figure 1 shows a footstool for the more advanced eighth- or ninth-grade boys. The principle of upholstering this type of footstool is similar to that described in the article on page 235 of the July, 1933, issue of this magazine, except for the welt around the top edge, and the use of two kinds or colors of material. Notice, also, that the frame is much more elaborately constructed, using a mitered spline joint at the corners. The legs are turned with a dowel end which is glued into the frame after the upholstery work is completed. The stock bill of materials follows:

Lumber

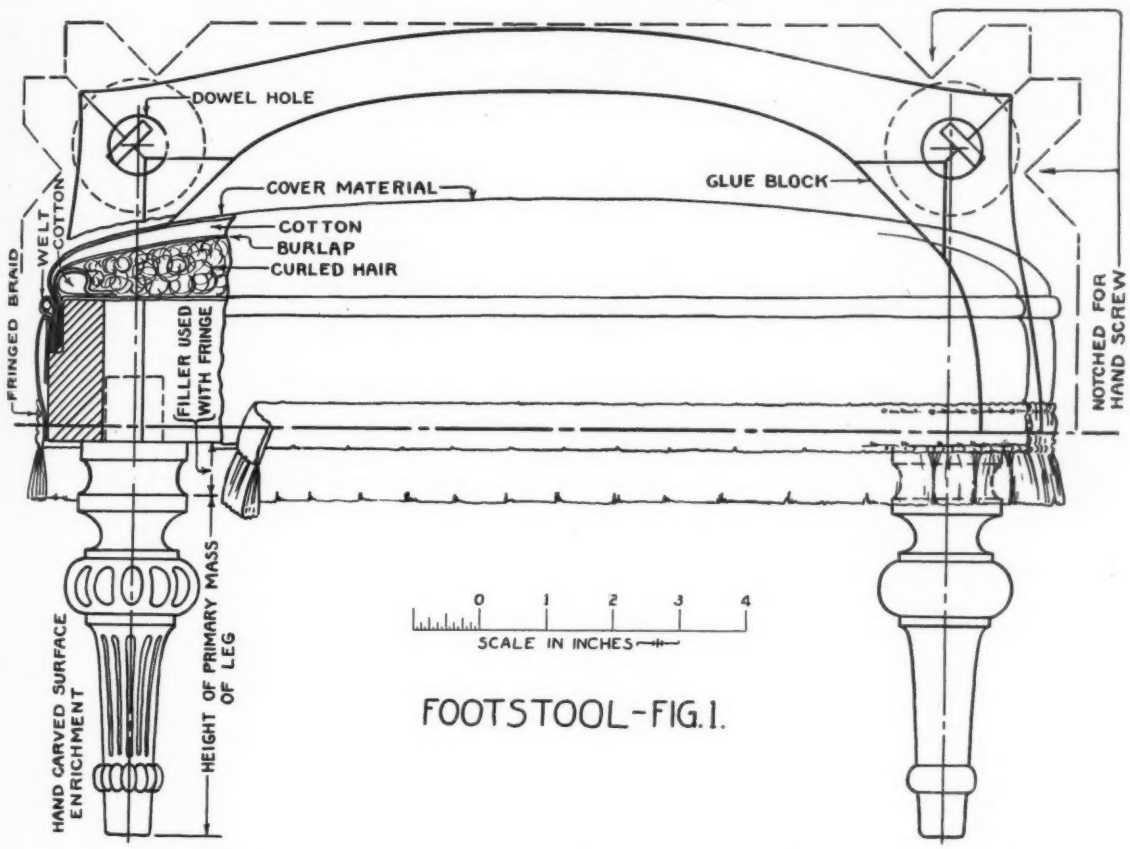
4 pc. 7	x 2 x 2	Mahogany, walnut, or gum	Legs
2 pc. 14½	x 2⅛ x 2	Basswood	Frame, sides
2 pc. 10½	x 2⅛ x 2	Basswood	Frame, ends
4 pc. 2⅛	x 1½ x 1½	Basswood	Glue blocks

Upholstery Material

4 pc. 15	x 18	Burlap	Webbing and subcover
1 pc. 2½	x 54	Burlap	Stuffing
2 lb.		Curled hair	Roll edge
1 lb.		Cotton	Stuffing cover
1 pc. 13	x 16	Cambric	Bottom cover
1 pc. 15	x 18	Tapestry, mohair, etc.	Top cover
1 pc. 1½	x 50	Tapestry, mohair, etc.	Welt cover
1 pc. 3/16	x 50	Fiber cord, twine, or cheap clothesline	Welt core
1 pc. 2¾	x 50	Tapestry, mohair, etc.	Side cover
1 pc. 2	x 50	Fringe	Trim

A supply of 4-oz., 6-oz., 8-oz., and 12-oz. common tacks and 3-oz. and 6-oz. gimp tacks should be on hand.

All members of the class making this style of footstool will use approximately the same-sized frame and height of leg, and use nearly the same curves in the contour of the frame. Each boy, however, is required to design his own contours for the footstool legs. The legs should extend 5½ to 6 in. below the mass of the stool. If fringe is to be used around the footstool, the lower edge of the fringe is to be considered as the bottom of the mass supported by the legs. Therefore, the amount that the fringe extends below the bottom of the footstool proper must be added above the primary mass of the leg so that the contour of the leg will not be partially hidden by the fringe. The length of the dowel is then added to this amount. See working drawing and compare with design D, Figure 2.



FOOTSTOOL-FIG. 1.

If the greatest diameter of the legs is such that it cannot be turned from standard-sized lumber, blocks must be glued to the leg stock at those sections. This is economy, and the practice should be required of every boy rather than that he should be permitted to use the next larger size standard lumber and waste much valuable material. It should be remembered, however, that it is also good practice in design to conform to standard sizes of lumber stock.

A full-sized detail drawing is required and it is suggested that more than one leg contour be drawn on a separate paper

in order that the best design may be chosen for the stool. A few suggestful helps are shown in Figure 2. These may be studied and compared best by the aid of a mirror which reflects the half drawing as the full shape of the leg. All lines other than straight lines should be drawn free-hand. Avoid

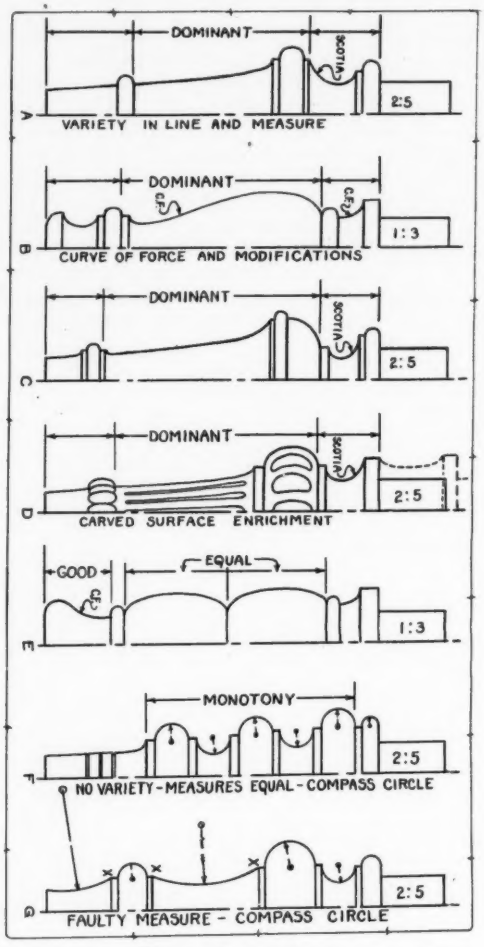


Fig. 2. Leg contours.

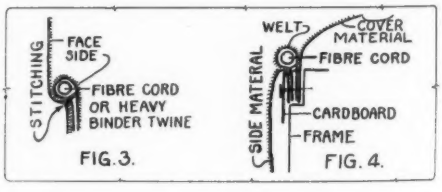
using a true or compass circle. See that all curved lines meet straight lines either at right angles or at a tangent to them. The scotia, a curve of beauty with an ever-changing direction of line, and much used in architecture and design, will prove useful in the making of leg contours. (See A, B, C, and D, Fig. 2.) Another beautiful line is that known as the curve of force. It is full of variety and is found in nature in the supporting stems of leaves and flowers. Its use in modified form is shown at C-F in Figure 2-B and E.

Consider the leg, below the fringe, as a primary mass the proportion of which is 1:3 or 2:5 and divide this into three horizontal spaces. The center section must be dominant while the two outer sections may be of equal or unequal measure. Each of the divisions just named may next be subdivided into two or three sections. If two sections are used, they should be decidedly unequal in measure. If three sections are used, the center one should be dominant and the other sections may be equal or unequal, following the same rule as used for dividing the primary mass. Avoid designing legs as shown at E, F, and G, Figure 2. These violate the principles of good design and are contrary to the suggestions on design given in the foregoing. Notice points X on leg G in Figure 2. The curved lines do not meet the straight lines as tangents or at a right angle. The curves at F and G, Figure 2, are drawn with a compass. At E and F the space divisions or measures are faulty, as several equal sections have been placed together. The lower part of the figure at F, where the curve of force is used, is good. After the designs are drawn and corrected the best one is chosen and transferred to the working drawing.

The legs should be turned and finished first so that they may dry and be ready for the frame when it is completed. The stock for the frame should be cut to length, width, and thickness, after which the miters are cut. For cutting the spline grooves, use the circular saw with the fence tilted at an angle of 45 deg. and with the lower edge ¼ in. from the saw. Cut the grooves ⅜ in. deep and as wide as the thickness of the saw. The spline stock may be cut to thickness at the planer. The grain of the spline should cross the miter joint for strength. Mark out the shape or contour of each side and end from a pattern or template and band-saw only the inside lines to contour. While at the band saw, cut notches at both ends of all pieces for the hand screws, as shown by the construction lines on the working drawing.

The next step in the procedure is to glue the frame together. Make sure that all joints are closed and that the work will rest on a true surface without rocking. When the glue is dry, band-saw the outer contour of the frame. Locate and bore the holes for the leg dowels. Cut a rabbet around the upper edge of the frame, deep enough to take the various thicknesses of burlap, top fabric, double thickness for welt and a thickness for side material. See the sectional view in Figure 1. Stretch and tack the burlap over the top of the frame. Next tack the rolled edge in place and upholster in the same manner as described for the footstool in the July, 1933, issue of this magazine, tacking the material around the top of the frame in the rabbeted section.

In cutting the material for the welt, remember that it should be of contrasting color 1¼ to 1½ in. wide and long enough to go around the footstool in a tight band when the ends are properly sewed together. Next, cut the material to be used for the sides. This should be 3½ in. wide and of some neutral color found in the top material. It may be made of one piece or more if necessary. The seams, however, should be made to come at the corners. This is also true of the seam in the welt. Sew a piece of heavy binding twine, 3/16-in. fiber cord, or cheap clothesline of proper length in the narrow strip of material forming the welt. Sew very close to the twine or cord so that the material will be tight around it. Keep the face side out. Next, sew the side material to the welt, face side against it, so that when turned down the face side will be out. Again, sew very close to the fiber cord. (See Fig. 3.) Stretch the assembled material over the frame and



adjust the welt so that it is the proper distance from the lower edge of the frame. Start out with a seam at a corner and work around the frame. Measure to the seam to see that the welt is in place and drive a tack close up at the seam or welt. This is done at intervals of two or three inches all the way around the footstool.

After this has been done, tack a ¾-in. strip of cardboard, all the way around, tight up against the welt. When the side material is turned down, the edge of the cardboard will keep the material from drawing downward and will form the edge in a straight line under the welt. (See Fig. 4.) Pad the sides

with cotton slightly as in the first footstool and draw the side fabric down over it and tack in place. Spread cold liquid glue under the material at the corners and miter the fabric on the undersides at the corners so it will not lap and cause unevenness where the legs are located. When dry, cut the upholstery

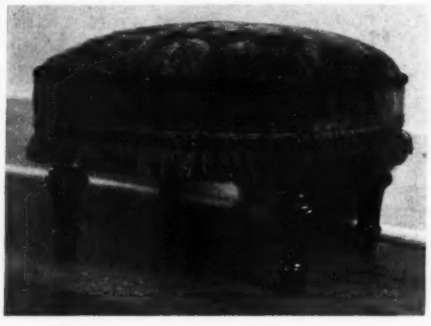


Fig. 5. The upholstered footstool.

material clear of the dowel holes to receive the legs. If fringe is used, this is not necessary, as tacks may be driven in the sides around the bottom of the frame. To give the underside of the footstool a finished effect, cambric, gray or black, is tacked neatly on the bottom of the frame. A few cuts across the cambric where the dowel holes are located will permit the legs to be glued in place. Before the glue sets on all four legs, place the stool on a true surface, such as a jointer bed, and adjust the legs so that it will not wabble. The bottom edge of the footstool may be left plain, but it will have a more finished appearance if trimmed with fringe, as shown in Figures 1 and 5. Suitable fringe may be purchased at upholstery shops or in large department stores.

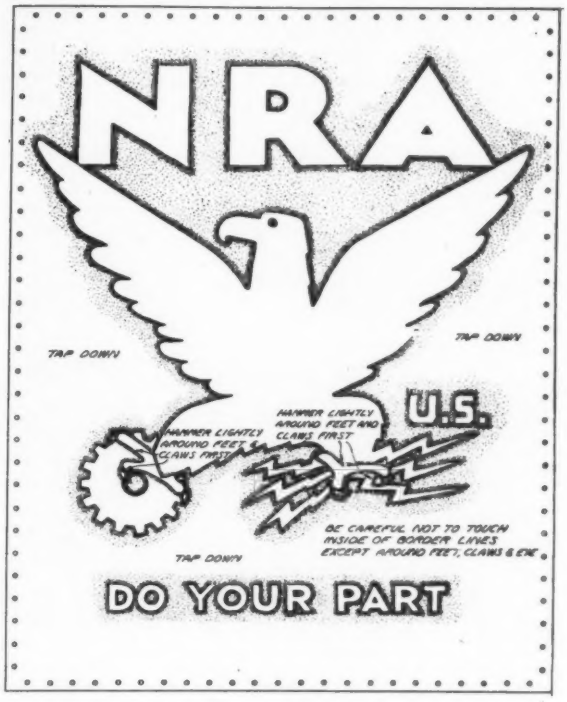
A COPPER N.R.A. PLAQUE

Colin D. Robertson, Vocational High School, Jamaica, New York

Any boy can make a presentable plaque by following these directions:

Make a tracing of the N.R.A. Blue Eagle insignia on tissue tracing paper. Paste this tracing right side up on a piece of clean 12 by 15-in. No. 22 gauge sheet copper, and allow it to dry. Secure a piece of wood, smooth on one side, about 1 by 14 by 16 in., which is not too soft. White pine or an old drawing board will do. Attach the sheet copper to the board using ⅜-in. No. 5 screws, placed ½-in. apart and 3/16 in. from the edge of the copper. The holes for the screws may be punched with a hammer and a nail. Do not use nails instead of screws, as they work loose when hammering and may spoil the work. Now hammer the outline with a 6-oz. hammer and a small chisel-point chasing tool. Start with the outline of the feet and claws and continue until the complete figure has been outlined.

Hammer the shaded portions of the design with a blunter matting chisel. This hammering stretches the copper which is confined within the screws and it begins to bulge and stand out in relief. Where the copper rises outside the design, tap it down carefully with the flat surface of the hammer, if there is a big enough space for the hammer, otherwise use blunt pieces of hard wood cut to suit the spaces. All hammering must be done very lightly and the copper must not be allowed to bulge outside the figure and letters. Great care must be exercised not to accidentally hammer the raised portions except around the feet and claws at the start, after which only the shaded portions are hammered, using the 6-oz. hammer and a blunt chasing tool. Regular chasing tools may be used, but our students make the chisel out of 20d nails filed to suit. Some pupils hammer the complete surface of the field outside the


NRA
TAP DOWN
TAP DOWN
HAMMER LIGHTLY AROUND FEET AND CLAWS FIRST
HAMMER LIGHTLY AROUND FEET AND CLAWS FIRST
U.S.
TAP DOWN
BE CAREFUL NOT TO TOUCH INSIDE OF BORDER LINES EXCEPT AROUND FEET, CLAWS & EYE
DO YOUR PART

Copper N.R.A. plaque.

outline, but, of course, this entails more work, though perhaps worth it.

When the copper has been removed from the wood, wash off the tracing (tissue paper) if it has not come off already. The copper will probably be stiff and springy and needs annealing by heating to a dull red. After annealing, lay the plaque on a smooth surface and with a hammer and flat piece of wood flatten down any unevenness of the field. Clean with fine steel wool and polish. Then lacquer or wax. The plaque may be oxidized after cleaning by dipping it in a solution of hot water and liver of sulphur, after which it must be given time to dry. It may then be polished on the high spots with fine steel wool after which it should be protected with a coat of clear lacquer. The plaque may then be mounted in a picture frame without glass.

THE MUCH-MISUSED HACK SAW

William Roseman, West Side Continuation School, New York, N. Y.

The hack saw is a very useful tool in any metal-working shop when properly used. The skilled mechanic almost automatically puts the blade in correctly, presses on the forward stroke, operates the saw at the correct speed according to the hardness and shape of material to be cut, etc. But, has this ever happened to you in the school shop:

1. You gave a boy a brand new blade to put into the frame, and told him how the blade must be put in, and how he should use it. He brings it back after making one cut, with the blade very much dulled. Looking at it shows that he has put it in backwards. This is aggravating and expensive.

2. Or if the blade happens to be in correctly, he operated the saw so fast — being accustomed to sawing wood probably — that the teeth were rendered useless? This happens particularly when cutting tool steel.

The simple visual aid described herewith has helped to almost overcome these difficulties. It was made by the machine-shop class, and consists of a much-enlarged model hack saw, mounted on compo board with instructions printed large

enough to be visible across the room. This has saved endless repetition of rules, as well as tempers, and blades.

The model hack-saw frame may be made of a piece of ⅛ by ½-in. band iron bent cold in the vise, as shown in Figure 1. Two ¼-in. holes are drilled for the rivets or screws which hold the blade in the frame.

The blade may be made of 1/16 by 2-in. cold-rolled steel.

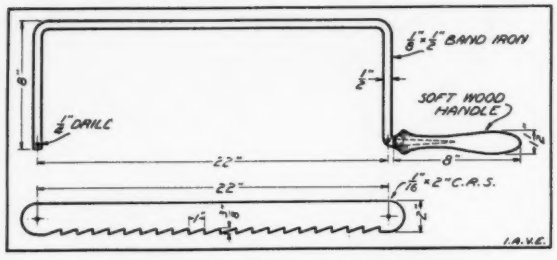


Fig. 1. Hack-saw details.

The pitch of the teeth should be very coarse so as to illustrate the shape of the teeth very clearly. The teeth are laid out carefully with dividers and are then sawed out with a hack saw.

Alternate teeth may be bent slightly in opposite directions with a pair of pliers, to make the blade look more realistic and to illustrate the "set" of the saw tooth.

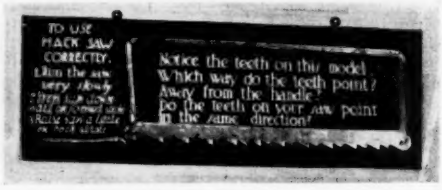

TO USE HACK SAW CORRECTLY.
Notice the teeth on this model. Which way do the teeth point? Away from the handle. So the teeth on your saw point in the same direction.

Fig. 2. Hack-saw model and chart.

The handle may be made of soft wood, turned in the lathe, and fastened to the frame, as shown in Figure 1. The finished model may then be tacked to a piece of 32 by 12-in. compo board. This is large enough so that the rules may be painted on it. The board is then hung above the workbench.

The rules should be few, and as simple as possible. Those shown in Figure 2 have been found effective. The boy is told to study the model, and read the chart, *before* he gets a new blade.

MODEL HOUSES IN HIGH-SCHOOL DRAFTING CLASSES

C. J. Sommerer, High School, Marshfield, Wisconsin

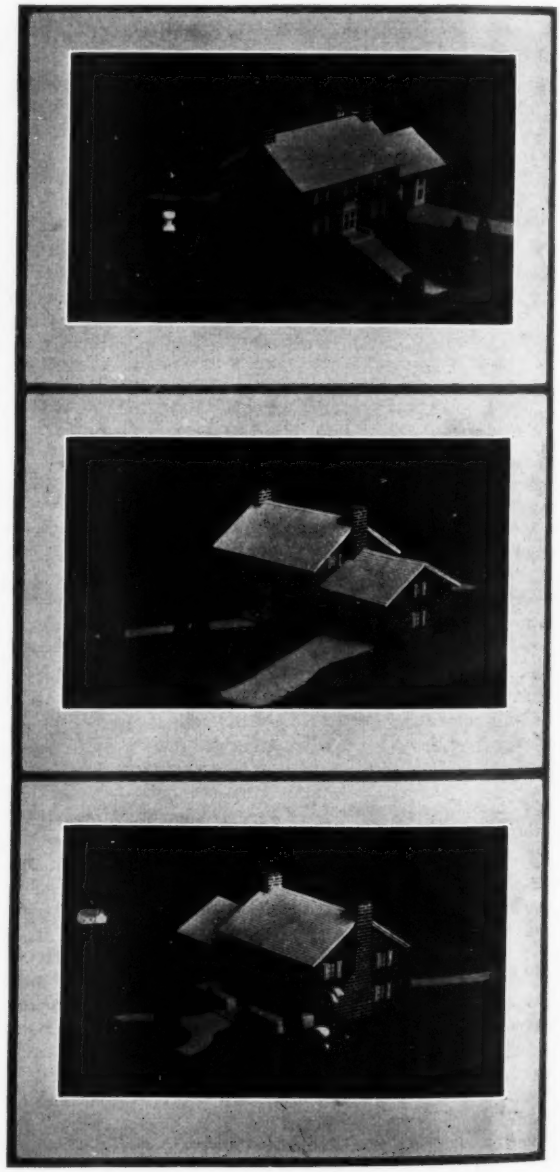
The accompanying illustrations show some of the scale models produced by sophomore students. Each student had previously completed a year of general drawing and then elected this course for further specialization.

The first semester was devoted to the study and drawing of details. Considerable correlated material and related information was given as each unit of instruction was presented, and at the end of each week a half-hour examination was given covering this phase of the work. Informational material covering such points as selecting sites, estimating cost, excavating, foundation data, and the like, also was given to each student.

At the beginning of the second semester each member of the class chose a house of specific type and style. Then the necessary floor plans, elevations, details, and a perspective rendered in colored pencil or water color was finished. Following this a complete set of building specifications were written, various building catalogs being used for reference. On the completion of the drawings, the models were constructed. Plywood panels about 30 in. square were used for the bases, and the walls and roofs were cut from ⅛-in. "Prestwood" building board. This particular brand of board was used because it is quite strong and can be planed and nailed just like lumber.

Shingles and sidings were made from cardboard and glued on. Bricks and stones were produced by spreading a thin layer of "Textone" plaster on the desired portion and marking it off in the required shape with a nail or a match after it had set for about 15 minutes. The entire models were painted with flat oil paint. Windows were made of tracing paper, water colored and inked off in the desired manner, and glued on from the inside. The lawns were produced by giving the base a coat of hot glue, after which green-colored sweeping compound was spread on before the glue had set.

Sandpaper painted with thin oil paint was used to represent concrete walks and drives. In the case of flagstone drives or walks the stone effect was produced by gluing down pieces of cardboard cut in the correct size and shape, and when dry,



Model houses produced in the architectural drafting class.

painting them the desired colors. Sponges were dyed and cut or pulled apart to produce the hedges and trees. Bird baths and lawn ornaments were carved in soap.

The boys showed unusual interest and willingness to work on these projects, and judging from the results obtained it appears that the time was well spent.

ANOTHER NONSKID OILSTONE

Donald G. Brossman, Buffalo, New York

A method of preventing the oilstone box from slipping on the bench by gluing a piece of sandpaper to its bottom, may be improved upon by following the scheme used by Mr. Clinton B. Burke, instructor in woodworking at Buffalo State Teachers College. Mr. Burke glues thin slices of ordinary bottle corks to each corner of the bottom of the box.

This prevents the box from sliding, but does not mar even a finished surface on which it may be set.

BRACKETS FOR BRIDGE OR FLOOR LAMP

F. E. Tustison, The Stout Institute, Menomonie, Wisconsin

On page 327 of the October, 1933, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, a base for a floor lamp was described. When an upright is attached to this base, the lamp is ready for a bracket. Brackets of the type illustrated in Figure 3 are easily formed cold and require only ordinary tools in construction. If round uprights are used, the bracket is adjustable to any position, that is, it can be turned around and moved up or down.

The designs available in this type of bracket are almost without number. Figures 1 and 2 shown several typical shapes. It is suggested that the student develop variations of his own.

For ½-in. uprights ¾-in. No. 10 iron is very satisfactory, and the brackets shown were all made of this size of stock. For larger uprights it would be necessary to spread the ¾-in. stock, or to use ⅞- or 1-in. widths.

Some kind of ornamentation is necessary for the top of the upright. This may be formed directly from the metal at the top of the upright, or it may be made separately and then attached (see Fig. 3).

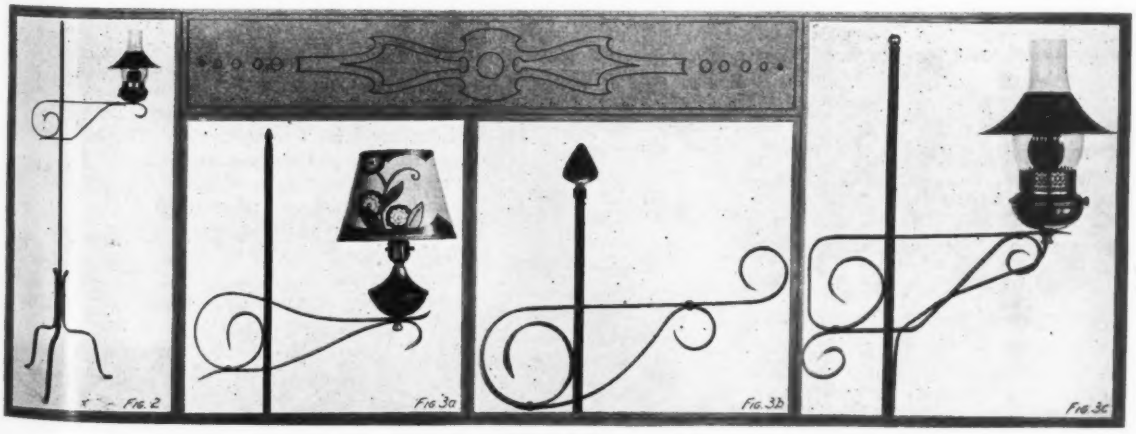
Display of model houses and plans.

Tools: rule, scriber, hack saw, file, bending fork, center punch, hammer twist drills, drilling machine, rivet set.

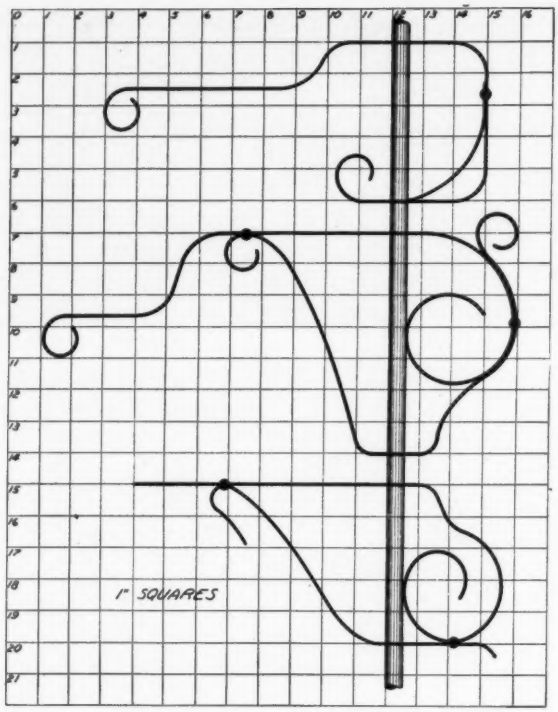
Material: ¾-in. by No. 10 mild steel, and 3/16 by ⅜-in. r.h. iron rivets.

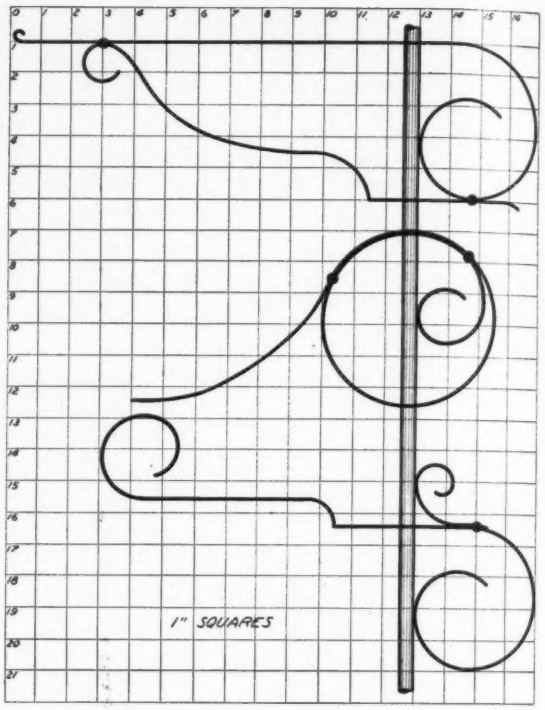
Procedure

1. Select or sketch a design that will go with the base. See illustrations for bracket suggestions.
2. Make a full-sized drawing of the bracket on 1-in. cross-section paper.
3. Cut out stock for all parts.
4. Form any special end design at this time.
5. If a hammer-mark finish is desired, do it before bending the parts.



Figs. 2, 3. Assembled bridge lamps.





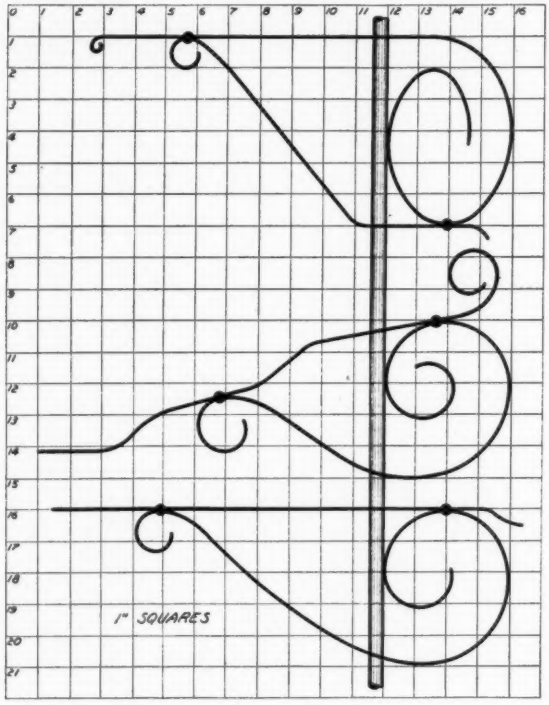


Fig. 1. Bracket designs.

6. Use a bending fork and form the curves. The full-sized drawing should be used for checking the scrolls.

7. Centerpunch and drill the rivet holes. For holes ½ in. and larger (for uprights), drill first with a small bit and then use the larger-sized drills to finish. Large bit-stock drills and the brace may be used if the holes must be drilled by hand.

8. For assembling the bracket, riveting is a favorite method. Short machine screws, tapped into the second piece, also may be used for this purpose.

The curved part on the inside of the bracket, which rests against the upright, should exert enough pressure to hold the bracket in place.

COMMON ERRORS OF THE FINISHING ROOM

U. G. Whiffen, The State College, Pullman, Washington

1. Using same brush in different finishes.
2. Rubbing filler with the grain.
3. Failing to clean brush immediately.
4. Applying two coats without proper sanding between.
5. Sanding too hard on undercoat.
6. Failure to give sufficient time for drying.
7. Applying shellac too thick.
8. Failure to remove machine and tool marks.
9. Failure to dust properly after sanding.
10. Not using proper solvent.
11. Working with poor light.
12. Allowing surplus filler to dry on surface.
13. Allowing oil rags or waste to accumulate.
14. Failure to replace lids on paint materials.
15. Applying any finish unevenly.
16. Failure to stir paint thoroughly.
17. Stir or agitate finishing varnishes.
18. Inaccurate weighing and measuring.
19. Applying coats of different bases on same piece.
20. Lack of cleanliness and care.
21. Improper ventilation.
22. Allowing shellac or varnish to collect in the corners.
23. Rubbing a varnish surface before it is thoroughly dry.
24. Using dry pumice for rubbing.
25. Using water and pumice for polishing.
26. Trying to stain over glue.
27. Trying to stain over oil and grease spots with water stain.

28. Thinning varnish with pure turpentine.
29. Applying water stain before the grain has been raised.
30. Exposing the piece to direct sunlight.
31. Using a coarse sandpaper for sanding down shellac.
32. Using a block when sanding down finish.
33. Not thoroughly dusting the article before it is taken into the finishing room.
34. Allowing the varnish brush to harden, by not keeping it in pure turpentine or thin varnish during the few minutes it is not used on the job.
35. Using a spirit varnish for high-class work which requires durability.
36. Not cleaning the paint cans properly.
37. Allowing students to test the color of the paint on the walls and project.
38. Using the solvent to clean a brush.
39. Heating alcohol and other inflammable substances on an open fire.
40. Using water stain on delicate veneer.
41. Brushing shellac too much.
42. Sanding a varnished surface with dry sandpaper instead of using oil, water, or gasoline.
43. Staining the most prominent part first.
44. Cutting sandpaper with shears or a knife.
45. Painting over pores filled with glue.
46. Working slowly with water stains.
47. Applying the same strength stain to the end grain as you do to the surface.
48. Not testing colors on same kind of material.
49. Applying filler with the grain of the wood.
50. Varnishing on an extremely damp or dry day.
51. Not having the finishing room free from dust.
52. Not avoiding direct draft on the work.
53. Using a "lousy" brush.
54. Not finishing a job after starting.
55. Not having a system in the care of brushes.
56. Rebrushing quick-drying finishes.
57. Sweeping the finishing room when pieces have just been finished.
58. Letting the brush flip off the end of the work throwing paint on the walls or other pieces.
59. Boys loitering in the finishing room.
60. Not rubbing oil stains from the corner of the work.
61. Letting filler get too dry before rubbing.
62. Rubbing or sanding across grain.
63. Keeping gasoline cans open in the finishing room.
64. Mixing oil stains with paint.
65. Handling finished pieces with dirty hands.
66. Failure to keep cleaning solvent upon metal part of brush.
67. Not filling pores when applying a filler stain.
68. Rubbing too much with gasoline when cutting down a finish.
69. Not having the room the right temperature.

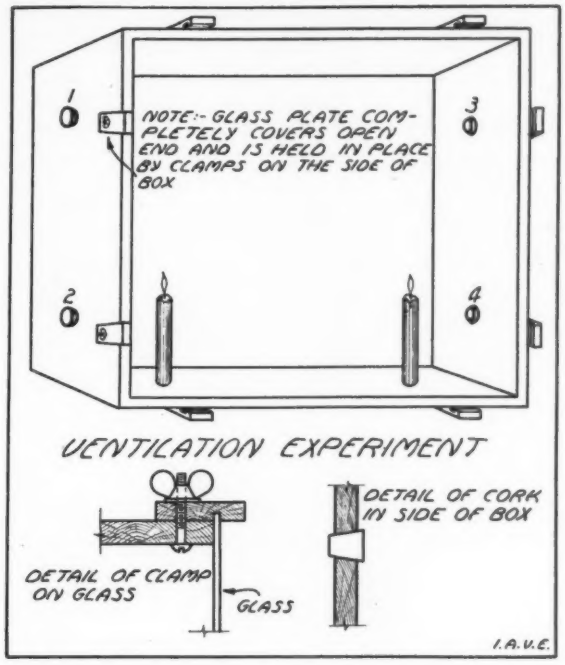
EXPERIMENT ON VENTILATION

C. L. Rich, The Stout Institute, Menomonie, Wisconsin

Man can, if necessary, live years without sunlight, weeks without food, days without water, but only several minutes without air. In spite of this, we still live in homes built with little provision for obtaining fresh air.

The apparatus described herewith shows strikingly how necessary it is to provide sufficient fresh air.

Make a tight wooden box 10 by 10 by 18 in. Open on one of the 18 by 10-in. sides. Make 8 cleats which will hold the pane of glass used to cover the open side. Bore 4 holes in the ends as shown at 1, 2, 3, and 4, and provide corks with which these holes may be closed tightly. Fasten two candles in place by first melting some of the wax of the candle on the floor of the box and then placing the candle in this wax as it solidifies.



Have the students work in groups of 2, 3, or 4 as conditions permit. The method of procedure is as follows:

1. (*a*) Light the candles. Secure the glass tightly against the front and remove cork No. 1 (or No. 3) and note results. (Both candles go out, the further one usually first.)

(*b*) Replace the cork, light the candles, and secure the glass in place. Then remove cork No. 2 (or No. 4). (Again the candles go out, this time the nearer one usually first.) Again replace the corks, light the candles, and close the front.

2. Remove corks 1 and 3. (The candles again go out, not quite so quickly, but both at about the same time.)

3. Replace the corks and again light the candle. Then remove corks Nos. 2 and 4. (This time also the candles go out, both at about the same time.)

4. Having replaced the corks and relit the candle, remove corks 1 and 4 (or 2 and 3). (This time each candle burns quite brightly and fairly evenly.)

5. Replace the corks and then remove corks 1 and 2 (or 3 and 4). (This time each candle burns very brightly and very evenly.)

6. Leaving conditions as in No. 5, allow an electric fan to blow on the side where the corks are removed. Note conditions. Then let the fan blow on the side where the corks have not been removed. (In the former case, the nearer candle is in danger of being blown out and neither burns very brightly nor evenly. In the latter case, however, both burn very brightly and evenly.) After the results have been recorded, each student is asked to explain each result carefully, and then draw his own conclusions as to the best method of ventilating a given room in a house, a set of rooms, or even a whole house.

Each student thus has demonstrated to himself that best ventilation is obtained by opening a window on one side, both top and bottom, and that if there is a wind it is best to open the window on that side of the house which is away from the wind. Further, he will remember that little real ventilation is accomplished by opening a window only at the top or only at the bottom on any one side.

BOOKBINDING TABLE

D. C. Marshall, Manhattan, Kansas

Someone has said, "Of the writing of books, there is no end." Even more true would this statement be if it had been said about the repairing of book bindings. These repairing jobs can be made very much easier if the proper kind of equipment is on hand.

Few tools are required for bookbinding beyond the vise and press which are shown on the table in Figure 1. For this reason, the bookbinding equipment requires little storage space.

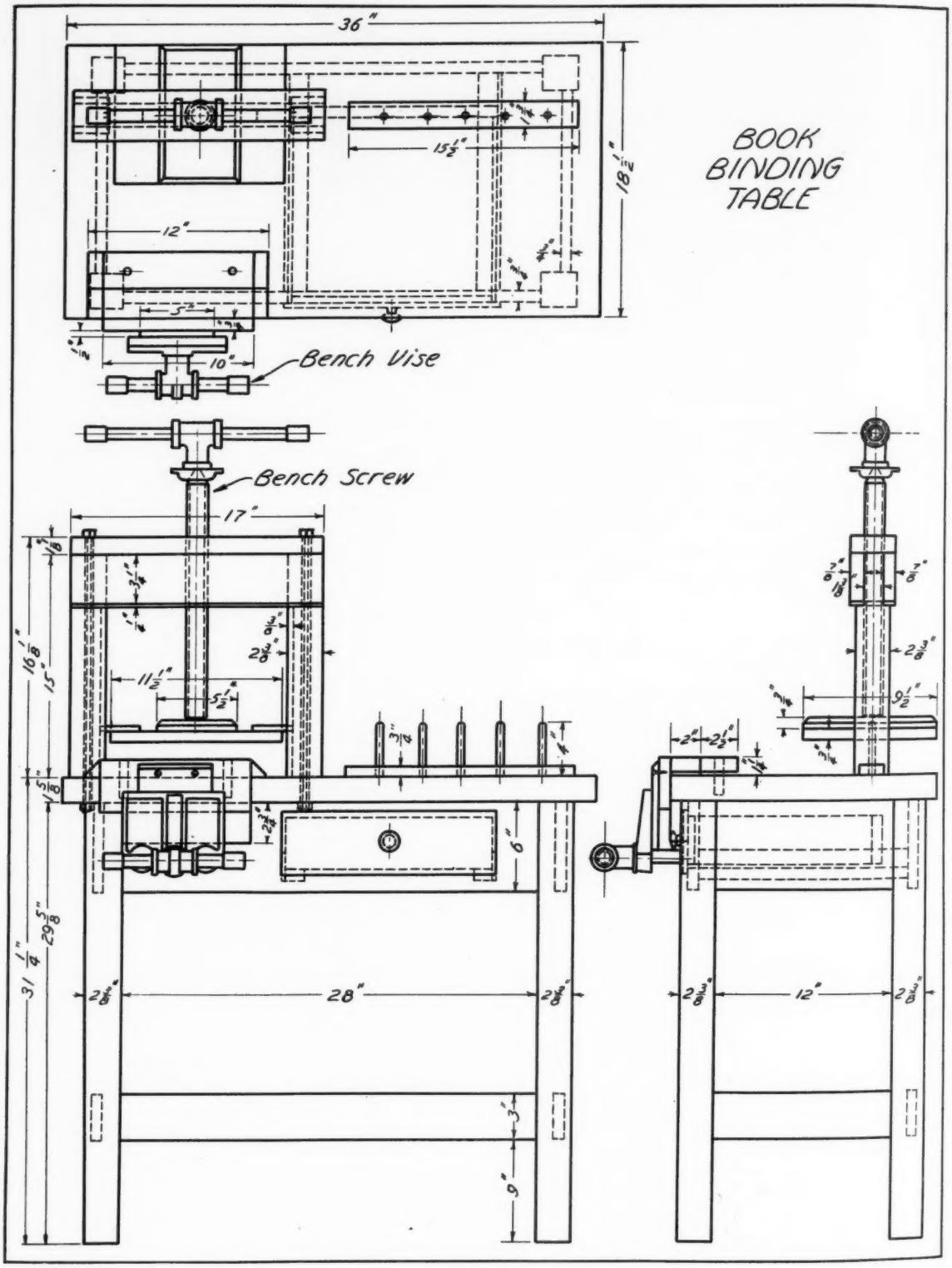


Fig. 1. Details of bookbinding table.

The details of the table construction are shown in Figure 1. Mortise-and-tenon joints are used in its construction. The drawer has compartments for scissors, needles, thread, folder, and drill, and the remainder of the space may be used for storing miscellaneous supplies.

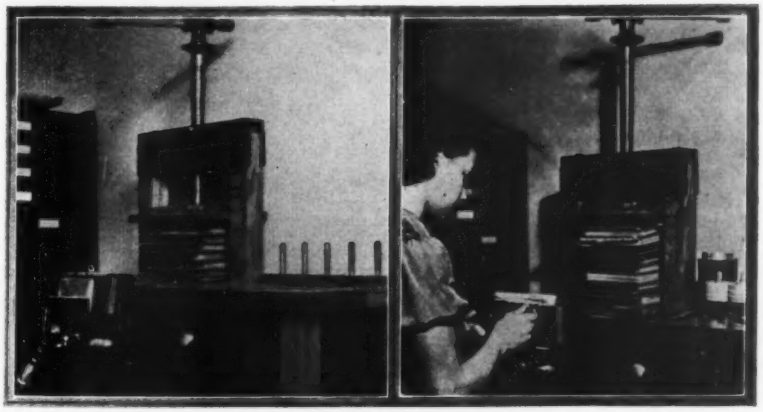
The pins shown on the top of the table are holders for the rolls of binder and mending tissue used in the repair of books.

The board which forms the pressure plate of the press is fastened to the end of the bench screw by a bolt tapped into the end of the screw. A wood jay is used on the front jaw of the vise. It extends enough to make it level with the block which is fastened to the top of the bench. The bench block can be replaced when it has been damaged by the drill in making stitch holes through books.

The material used in the construction of the table is oak, finish natural.

When books must be sewed, the vise provides a rigid clamp for holding the book until the sewing has been completed. After the covers have been pasted, the book is placed in the press until the paste has dried.

This useful piece of equipment will enable any school to keep its library books in repair at very small cost.



Bookbinding table in use.

A GOOD RUST PREVENTIVE

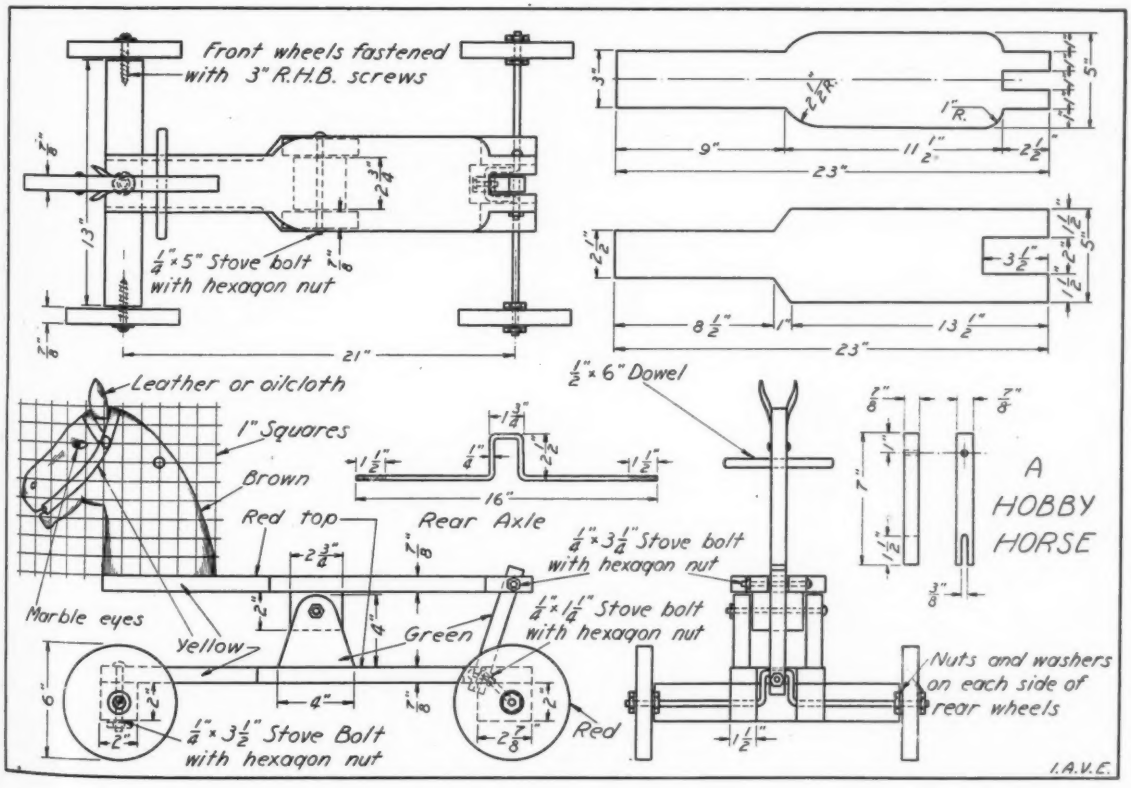
Before packing away shop tools for the summer, they should be treated so that they will not suffer from rust. A rust preventive that can be applied either with a rag or a brush may be made by melting two ounces of rosin in one pint of hot linseed oil. After all the rosin has been melted, one gallon of kerosene oil should be added. When school opens, the mixture may be wiped off the tools without any trouble.

A HOBBYHORSE

Louis Schiff, Bronx, New York

The interesting toy illustrated and described herewith will be found to arouse quite a bit of interest in the school shop.

This hobbyhorse may be pulled along with a child seated on it, or it may be propelled by the youngster himself. The front axle is pivoted at the center so that the horse may be steered at will. The rear wheels are firmly fastened to the rear axle (crankshaft axle) by threading both ends of the axle for a sufficient distance to accommodate two nuts, two washers, and the wheels. The first step is to thread a nut onto the axle until it is firmly backed up against the end of the thread. Then put on a washer, then the wheel, another washer, and then the nut, the latter being drawn up so tightly that the wheel will not revolve without turning the entire shaft. Children using this hobbyhorse will be delighted with the up-and-down motion given to it by the crank.



Personal News

¶ Dr. Verne C. Fryklund, of the College of Education, University of Minnesota, Minneapolis, Minn., and Mr. O. B. Adams, State Director for Vocational Education, Salem, Oregon, will both be guest teachers at the summer session of the Department of Industrial Education at Oregon State College, Corvallis, Oregon.

¶ Mr. Arthur L. Reagh, supervisor of industrial arts at Grand Rapids, Mich., has been elected secretary-treasurer of the Michigan Industrial-Education Society.

New Publications

Forest Facts for Schools

By Charles L. Pack and Tom Gill. Cloth, 336 pages, 5½ by 8, illustrated. Price, $1. Published by The Macmillan Company, New York City.

The authors have succeeded in writing an extremely interesting and sympathetic book on trees, the forest, forestry, and forest products. It is well illustrated and each section of the book contains a number of exercises for the student as well as tests in the form of true-and-false questions.

An Early American Home

By Claude H. Miller. Cloth, 238 pages, 6⅜ by 9½, illustrated. Published by Thomas Y. Crowell Company, New York City.

This delightful book, in which the author tells how he planned and built an early New England home, can be read with profit and enjoyment by anyone who has aspirations of building a period house.

Guidance at Work

By Milo H. Stuart and DeWitt S. Morgan. Cloth, 104 pages, 5⅛ by 7¾, illustrated. Price, $1.60. Published by McGraw-Hill Book Company, Inc., New York City.

This is a book which describes the organization and method of carrying on guidance work in the school. It describes a number of typical cases, gives the method of procedure, the forms that may be used, and shows just how the entire work may be carried on.

Elementary Electricity

By Edgar P. Slack. Cloth, 278 pages, 5½ by 8⅛, illustrated. Price $2. Published by McGraw-Hill Book Company, New York City.

This textbook contains a large number of good practical problems for the electrical student. It covers both d.c. and a.c. electricity. It may also be used for home study.

General Servicing

By J. A. Roenigk. Paper, 91 pages, 8 by 11, illustrated. Price, $1.25. Published by McGraw-Hill Book Company, New York City.

This manual covers the servicing instructions on the fuel, exhaust, lubricating, and cooling systems of automotive engines.

A teacher's guide, which is designed to aid the instructor and which contains a synopsis of the entire series of manuals, will be mailed free to any teacher upon request.

Dictionary of Color

By A. Maerz and M. Rea Paul. Cloth, 207 pages, 8¾ by 11⅝, illustrated. Price, $12. Published by McGraw-Hill Book Company, New York City.

This extensive reference work seeking to relate colors with their names, attempts to do for color what dictionaries do for languages. It contains 56 color plates, so arranged that the colors having definite names can be easily identified. The appendix contains a list of terms found in the literature of color, the frequency of use of the principal color names, a polyglot table of the principal color names, and a comprehensive bibliography.

Features and Faces

By George B. Bridgman. Cloth, 64 pages, 8⅜ by 11¼, illustrated. Price, $3.50. Published by Bridgman Publishers Inc., Pelham, New York.

In his usual clear, concise, and graphic way, the author describes how to use the pencil in portraying the human face.

Associations, Conventions

MASSACHUSETTS INDUSTRIAL-EDUCATION SOCIETY MEETING

The May meeting of the Massachusetts Industrial-Education Society was held at the Farm and Trades School, Thompson's Island, Boston. This school was established in 1814 for worthy boys between the ages of 10 and 14 who are physically and mentally normal. Preference is given to underprivileged boys.

The school offers academic education comprising the usual school subjects. The practical work is divided into eighteen departments and each boy works in ten of these departments during his six-year course. Civics is taught through a city government plan, called Cottage Row Government. The boys elect their own officers and obtain first-hand experience in self-government. — *Louis A. Van Ham.*

THE WESTERN PENNSYLVANIA INDUSTRIAL-ARTS CONFERENCE

The Western Pennsylvania Industrial-Arts Conference was held at the State Teachers' College, California, with President Robert Steele, of the college acting as chairman. The meeting was attended by 400 teachers and directors of industrial arts in the state.

Dr. Steele, in opening, emphasized the economy of keeping a boy in school rather than in a penitentiary.

Mr. S. L. Coover, director of industrial arts in the college, introduced Hupp Otto, president of the Upper Ohio Valley Industrial-Arts and Vocational Association, of Wheeling, W. Va., who acted as chairman for the morning session.

Mr. W. E. Brunton, state supervisor of vocational education, Harrisburg, gave an interesting talk on "The Trend of Industrial-Arts Work in Pennsylvania." He pointed out that the present tendency is to give more information and emphasize skill less than formerly. He held that the project reflects the kind of work done in the school and that the by-products should give the student a stock of desirable habits.

Dr. William T. Bawden, Manual Arts Press, Peoria, Ill., talked on "The Significance of Industrial Arts in Modern Education." He emphasized the value of industrial-arts work and said that no school system would undertake to dispense with the industrial arts if it aims to keep pace with the findings of scientific investigation, the conclusion of logical reasoning, or the demonstrated laws of learning.

Mr. Glen U. Cleeton, of the Carnegie Institute of Technology, was in charge of the discussion, while Mr. Frank M. Leavitt, of Pittsburgh, gave an announcement concerning the A.V.A. in Pittsburgh, December 5 to 8.

At the men's club dinner, Dr. G. D. Whitney, of the University of Pittsburgh, acted as chairman of the meeting, and Dr. James N. Rule, state superintendent of public instruction, delivered the principal address. He contended that there is need for more state and federal aid if the schools are to be kept in operation.

A feature of the convention was the exhibit of the work of students in the college and the neighboring schools. — *George C. Donson.*

ILLINOIS VALLEY INDUSTRIAL-EDUCATION CLUB

The annual combined meeting of the Illinois Valley Club and the Peoria Home Economics' Club was held on Monday evening, April 16, at Peoria.

The meeting opened with a one-act play, given by the Mask and Gavel Club of Bradley Polytechnic Institute. Mr. Tom Correll, of Peoria, gave a demonstration of what a good memory should be. About 45 members of the two organizations were in attendance.

The last meeting of the Illinois Valley Club for the season was held May 14, at Pekin. Members were present from the Peoria and Pekin schools, Bradley Institute, Caterpillar Training School, and the Elmwood schools.

Mr. J. H. Brewer, the principal speaker, talked on "Wood and Boys," in which he declared that the purpose is not to teach industrial arts, but to teach through industrial arts. He said that shopwork comes nearest to the life situation in any high-school subject and that it creates good social attitudes, logical procedure, and accuracy.

Mr. O. Connett, of Peoria, was elected secretary for the 1934–35 school year. Floyd Lee, Pekin, was made director of the club work for the next year. — *F. L. Barloga.*

DAYTON INDUSTRIAL-ARTS CLUB MEETS

The Dayton Industrial-Arts Club held its annual dinner meeting May 3, at the Engineers' Club. Dr. William E. Warner, of Ohio State University, spoke on the topic, "Some Conclusions on our Professional Perspective," in which he declared that the coördinating and developing of practical-arts interests to prepare youth for the present-day living is of vital importance to all teachers and administrators. He emphasized that the fundamentals of education today are not the old accepted three R's of yesterday, but the preparation of youths to cope with modern civilization. Increased leisure has brought new problems for solution by the educator. Boys and girls must be taught diversified occupations and must be taught how to adapt themselves to the things they meet in everyday life. The industrial arts have ceased to be considered a special subject and have become an integral part of the general educational program.